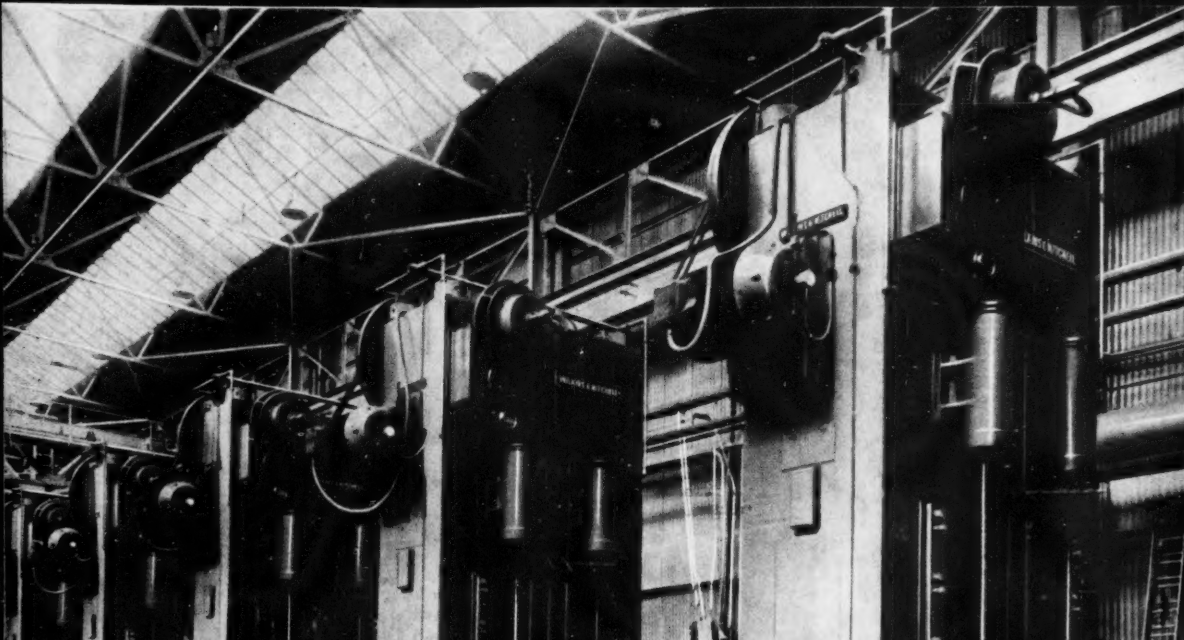
MACHINERY

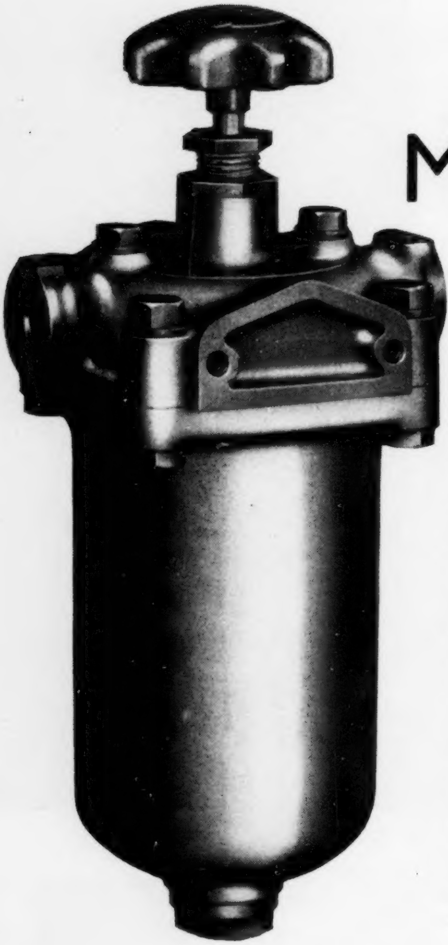
AUGUST 27, 1958 ONE SHILLING & THREEPENCE



300 [illegible] Single Point Suspension Presses at Vauxhall Motors


50%
increase
in inches
FIRTH BROWN TOOLS LTD.
SPEEDICUT WORKS · SHEFFIELD

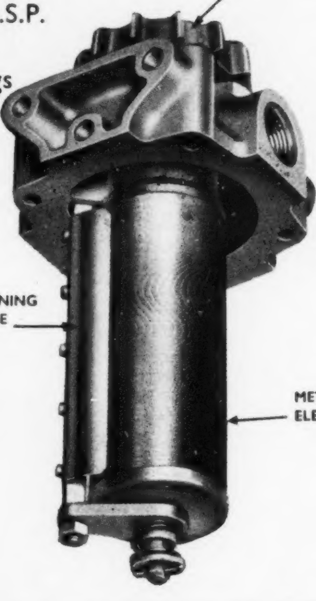
When answering advertisements kindly mention MACHINERY.



METAL-EDGE FILTERS

These filters incorporate the Purolator precision-wound metal element which presents a series of knife-edged orifices to the incoming fluid. This ensures that all arrested contaminant remains on the outer surface of the element so that it can easily be cleaned off. The type shown here is fitted with a mechanical cleaning device which will remove dirt from the element whilst it is actually working.

A range of sizes from $\frac{3}{8}$" to 2" B.S.P. is available and element spacings from ·002" to ·020" can be provided.

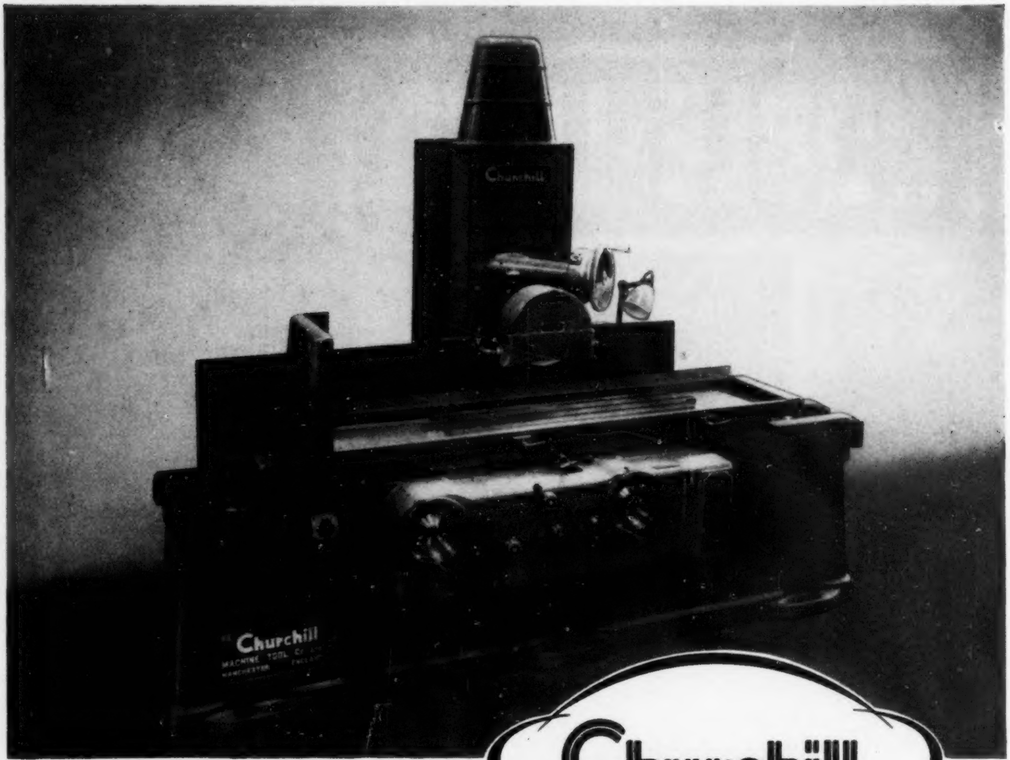


PUROLATOR

Regd. Trade Mark: Purolator

AUTOMOTIVE PRODUCTS COMPANY LIMITED
LEAMINGTON SPA, WARWICKSHIRE, ENGLAND


NOBLE & LUND
'Fluifeed'
VERTICAL
COLD CIRCULAR
SAWING MACHINES
Motor-driven live work rollers are provided at each side of the machine when required.
The FLUIFEED range includes Cold Saws for every duty. Full details will be sent on request.
NOBLE & LUND LTD. GATESHEAD, 10



Churchill

'OSB'

HORIZONTAL SPINDLE SURFACE GRINDING MACHINE

This machine is designed for work requiring extremely accurate and highly finished flat surfaces. Besides being ideal for toolroom work and for die grinding, the Model 'OSB' can be used to advantage in the production line. High rates of output are obtainable. Built in three sizes with work tables 30in. by 10in., 42in. by 10in. and 60in. by 10in.

Easy and simple operation.
Built-in motor drive to grinding wheel spindle. Motorised automatic pump lubricating system and simple bearing assembly give a high precision spindle capable of heavy grinding cuts.
Variable hydraulic cross feed to wheel. Pre-set automatic cut-out and automatic reverse.
Fine and coarse vertical feed.
Massive cross slide underneath wheelhead column gives large area of support and maximum stability.
Hydraulic table traverse up to 90 feet per minute. Hand traverse interlocked with hydraulic control.
Permanently protected precision ground table slideways.
Table traverse ways, wheelhead cross slideway and cross feed gears and bearings automatically lubricated from oil supply independent of hydraulic system.

ASSOC. BRITISH MACHINE TOOL MAKERS LTD

THE CHURCHILL MACHINE TOOL CO. LTD. BROADHEATH, NR. MANCHESTER

Telephone: Altrincham 3262. *Telegrams:* Churchale, Manchester

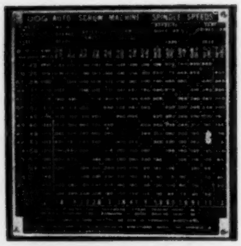
Export Sales Organisation: ASSOCIATED BRITISH MACHINE TOOL MAKERS LTD. LONDON, BRANCHES AND AGENTS

Home Selling Agents: CHARLES CHURCHILL & CO. LTD., BIRMINGHAM AND BRANCHES

PRECISION *plus* PRODUCTION

C662


AN APE PRODUCT
The
MICROBALL
HEIGHT GAUGE &
BALL COMPARATOR
MADE TO MEASURE
12" UNIT
£24
24" UNIT
£55
INDICATORS EXTRA
TRADE ENQUIRIES INVITED—SEND FOR ILLUSTRATED LITERATURE
ALL PRECISION ENGINEERING LTD . KINGS ROAD . HORSHAM . SUSSEX . HORSHAM 2227/8



196 Combinations, 14 ratios of spindle speed range, 6050 to 50 RPM

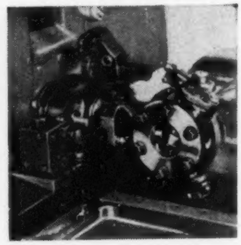
FOR MAXIMUM PRODUCTION CONSISTENT ACCURACY AND GOOD FINISH AT LOW COST PER PIECE

there's none to excel

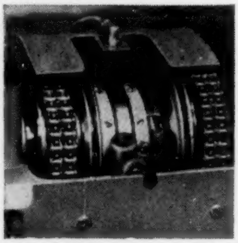
BROWN & SHARPE

British Made

No. OOG HIGH SPEED AUTOMATIC SCREW MACHINES

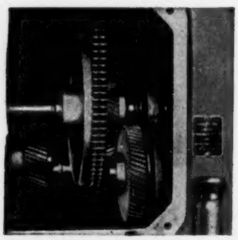


Low idle time provides high production

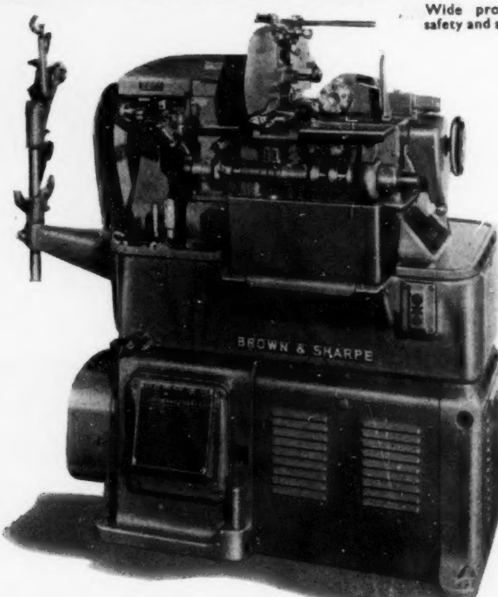


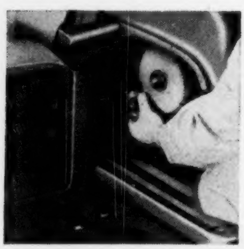
Spindle has powerful, positive chain drive at all speeds

Wide production range with safety and surety



Compact driving mechanism has automatic lubrication



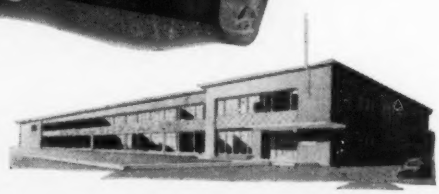


Spindle speeds quickly selected by pick-off gears

If you're interested in Automatics, why not send for a descriptive brochure on this New OOG to the Sole Agents in Great Britain for BROWN & SHARPE LIMITED

BUCK & HICKMAN LIMITED

Machine Tools **- Otterspool Way, Watford By-pass. Herts.**
Head Office **- 2/8 Whitechapel Road, London, E.I.**
Branches **-Alperton. Birmingham. Glasgow. Leeds. Manchester.**



A NEW WATFORD EXTENSION.

FOREIGN

MICROTEST HIGH SPEED
PRECISION TAPPING ATTACHMENTS
SIZES FROM $\frac{1}{16}$in. TO 1¼in. DIA.

● **FEATURES** adjustable friction clutch eliminating overload and tap breakage. Can be used vertically or horizontally. Graduated scale for correct setting for size of tap in use. All moving parts hardened, ground and lapped. Made by manufacturers with 40 years' experience.

STOCK OR EARLY DELIVERY

W. URQUHART 1023-7 Garratt Lane, S.W.17 Balham 8551 (5 lines)

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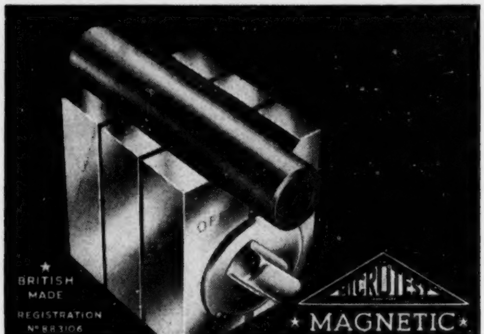


MICROTEST
PRECISION MAGNETIC VEE BLOCKS
★ **WORLD RENOWNED** ★
FOR TOOLROOM ● OR PRODUCTION
MADE OF TOUGHENED STEEL, HARDENED AND GROUND ENSURING CONTINUED ACCURACY
NOT TO BE COMPARED WITH CHEAPER NON-HARDENED TYPES ON THE MARKET
Microtest Vee Blocks are in a class apart

W. URQUHART 1023-7 Garratt Lane, London S.W.17. BALham 8551 (5 lines)

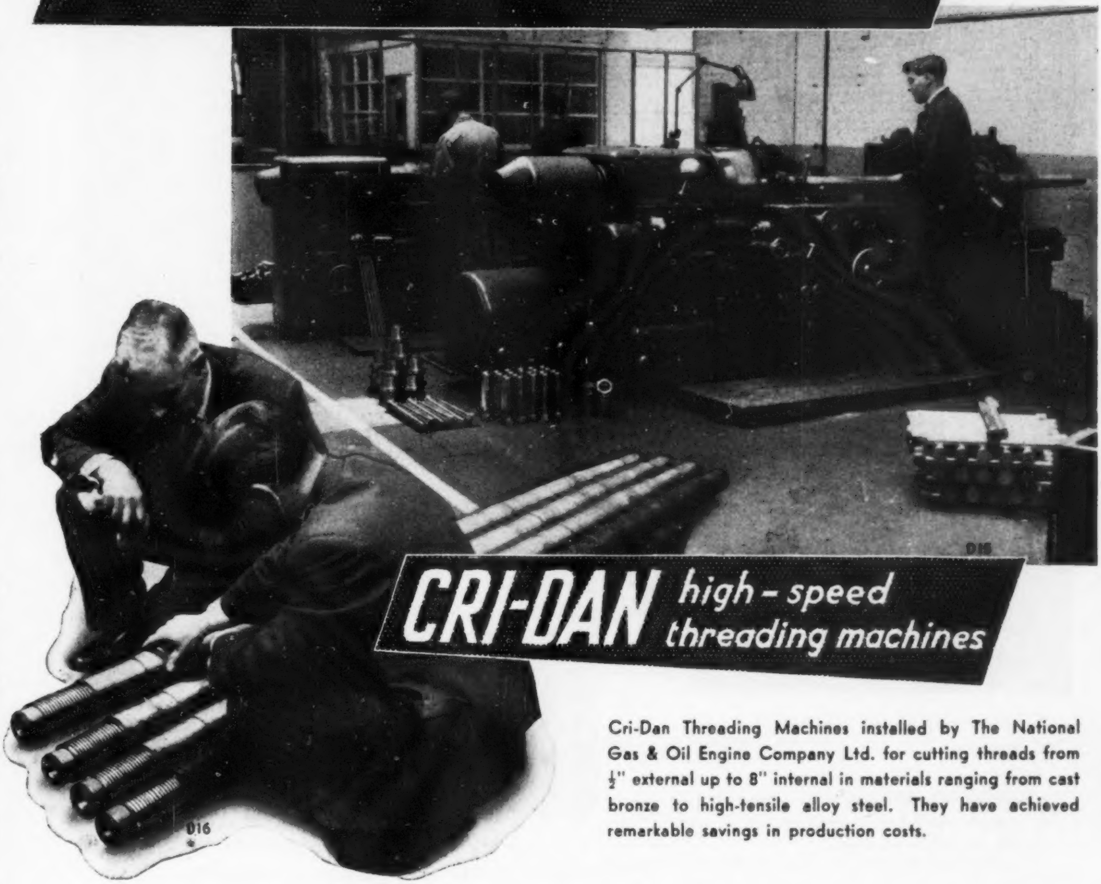
★ NEW ENGLAND
10" STROKE
SHAPER

4 SPEEDS
45, 60, 82, 115
●
RISE & CROSS AUTO FEEDS
●
SWIVELLING TABLE
●
INCHING WHEEL
●
3 PHASE OR SINGLE PHASE
●
FOR PRODUCTION OR TECHNICAL SCHOOLS
●
LOWEST PRICE ! !

● BRITISH MADE ●

W. URQUHART 1023-7 Garratt Lane, London S.W.17. BALham 8551 (5 lines)

thread chasing on a semi-automatic



CRI-DAN high-speed threading machines

Cri-Dan Threading Machines installed by The National Gas & Oil Engine Company Ltd. for cutting threads from $\frac{1}{2}$" external up to 8" internal in materials ranging from cast bronze to high-tensile alloy steel. They have achieved remarkable savings in production costs.

Precision threads cut in a fraction of the time taken on a thread miller or centre lathe. Capable of cutting external or internal, parallel or taper, right or left-hand, single or multi-start, threads in all forms and in any material that can be threaded.
Attachments for boring, turning, facing and chamfering in the same set-up as threadings, can be fitted.

Two sizes for cutting threads up to 4" (ext.) 6" (int.) and 12" (ext.) 16" (int.). Max pitch cut 5 and 2 t.p.i. respectively.

ALFRED HERBERT LTD., COVENTRY
Factored Division, Red Lane Works.

AD.447

When answering advertisements kindly mention ***MACHINERY.***

When answering advertisements kindly mention MACHINERY.

PNEUTOMATION

a power for production that's yours to command

What you need in your works is this pocket-sized elephant — PNEUTOMATION! You'll find PNEUTOMATION has all the power of a pachyderm, plus compactness. You get the same tireless energy, accurately applied to the right place at the right time, under perfect control. PNEUTOMATION is tailor-made to work with the minimum of elbow room and the wide range of standard equipment fits any job from bell-ringing to jig-boring. Simple design, careful workmanship and completely non-corrodible materials cut replacement and maintenance costs, make Lang PNEUTOMATION a really long-lasting, trouble-free system.

Pneutomation never forgets to operate

The 'Pneulang' basic cylinder unit, just one of the 284 cylinders available 'off-the-shelf'. The range of PNEUTOMATION equipment also includes many types of manual and automatic valves, lubricators, air flow regulators, pipes and fittings, etc.

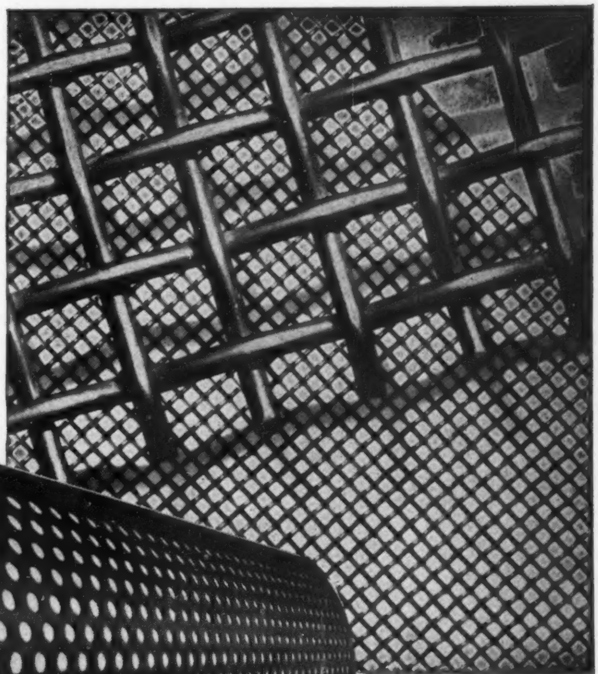
PNEUTOMATION
energy under control

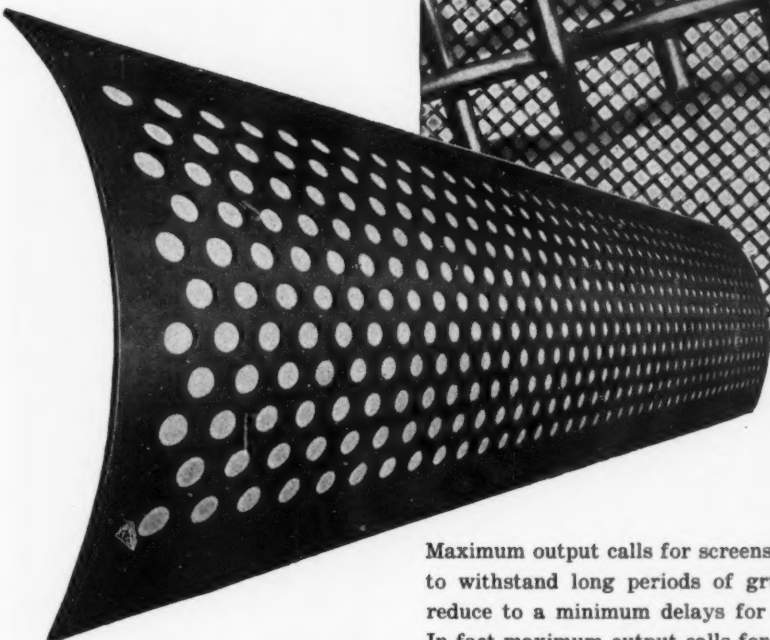
Plan with
LANG PNEUMATIC LTD
VICTORY WORKS BIRMINGHAM ROAD WOLVERHAMPTON Tel: 25221-2-3

Associated with Desoutter Brothers (Holdings) Ltd.

P.1651

For MAXIMUM Output





Maximum output calls for screens that are tough enough to withstand long periods of gruelling service, and so reduce to a minimum delays for repair or replacement. In fact maximum output calls for

'HARCO' PERFORATED METAL AND WIREWORK SCREENS

Please ask for Catalogues Nos. MN858 and MN926

Harvey

Supplied as flat or curved plates, or as complete screens to specification, in a wide range of gauge, mesh and pattern for every screening, sorting or sizing requirement.

G. A. HARVEY & CO. (LONDON) LTD
Woolwich Road, London, S.E.7. GREenwich 3232 (22 lines)

What do Desoutter do?

In response to an urgent appeal from the M.D. a careful survey, designed to discover the impact of 23 years' advertising, has recently been completed. In this nation-wide survey thousands of people were asked, "What do Desoutter make?"

2% said "Miniature Horses"
3% said "Hair Restorer"
0·5% said "Weak Jokes"
94·5% "Didn't Know"

The M.D. was most displeased. "I'm not suggesting," he said, "that our advertising hasn't done a quite subliminal job on their collective unconscious, but in one respect at least it may be said to have failed. Let us correct this now, gentlemen:

DESOUTTER BROS LIMITED

make

Pneumatic

(i.e. driven by air)

and Electric

(i.e. driven by electricity)

Power Tools

(i.e. tools which for the purpose of this argument are driven by air or electricity)

Desoutter Brothers Limited, The Hyde, Hendon, London, N.W.9.
CRC 302

For Maximum Production on Capstan and Turret Lathes

INSTALL

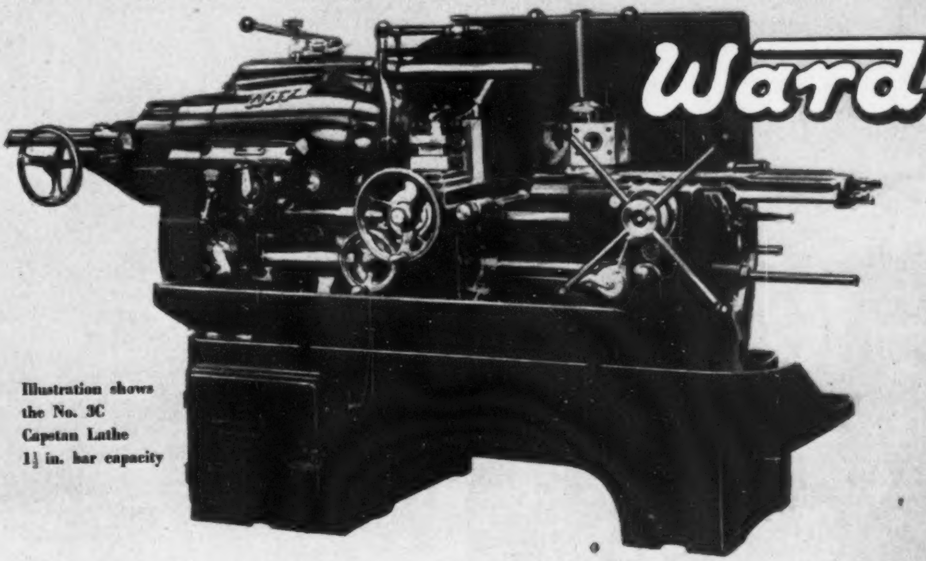


Illustration shows the No. 3C Capstan Lathe 1½ in. bar capacity

Many new features include
12 spindle speeds – both forward and reverse
Higher centres giving increased swing
Bed protected by stainless steel covers
Inbuilt electrical equipment
Large capacity swarf pan

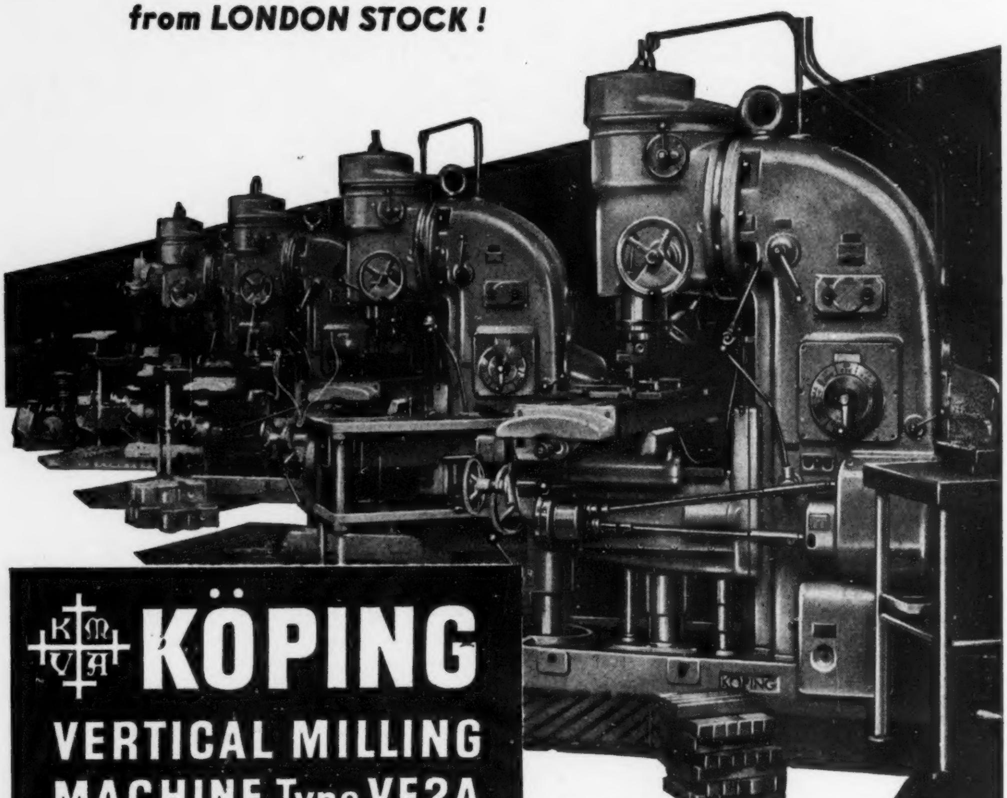
Full details of our complete range of Capstan and Turret Lathes on request.

H·W·WARD & CO LTD SELLY OAK BIRMINGHAM 29
TELEPHONE SELLY OAK 1131

W670

★ IMMEDIATE DELIVERY

from LONDON STOCK !



KÖPING

VERTICAL MILLING MACHINE Type VF2A

Köping VF2A *Vertical Milling Machines—Table size 59 × 14—in operation at the Metal Box Co. Ltd. on general precision engineering and high production work.*

In addition to power feed in all three directions of table, they have power feed to spindle and adjustable stops. Also rapid power feeds on all movements. Swivelling head, autocycle movement in longitudinal traverse of table. Adjustable drop worm, disengagement of power feed to spindle which is furnished with an efficient brake for rapid stopping. A large range of optional extra equipment for accurate adjustment of table and accurate depth milling for jig boring purposes. Power circular milling with indexing attachment, etc. Robust construction, unsurpassed Quality and Workmanship.

DISTRIBUTORS AND STOCKISTS FOR THE UNITED KINGDOM

MORTIMER ENGINEERING COMPANY

PROPRIETORS S. GUITERMAN & CO. Ltd

Showroom & Sales: 204-206 ACTON LANE · HARLESDEN · N.W.10 Tel.: ELGAR 3834

Indicating r.p.m. of electric motor.

Indicating shaft speed, showing use of extension.

Indicating surface speed.

The Right REVS

Run your machinery at the optimum speed for peak efficiency. Any deviation from this speed almost certainly means that it—and you!—are running at a loss.

Cut this loss by making spot checks of r.p.m. with a SMITHS Hand Tachometer. Such a check can be made in an instant, even in unfavourable conditions. What's more, the reading is accurate to within ½%.

SMITHS HAND TACHOMETERS can be used for checking:—

Rotational speeds of shafts, spindles, gears, rotors and rolls.

Linear speeds in ft/min or metres/min of metal strips, textiles, paper, wire, plastic, film and conveyed material.

Surface speeds in ft/min or metres/min of cutting or grinding operations of machine tools, processing rolls, unwind rolls or wind up rolls for extrusion and strip production.

Readings can be taken in bad lighting conditions or where the dial is visually obscured.

AVAILABLE IN CHOICE OF FOUR MODELS:—

Model A.T.H. 4 (0-50,000 r.p.m.) illustrated

Model A.T.H. 6 (0-10,000 r.p.m.)

Model A.T.H. 7 (0-20,000 r.p.m.)

Model A.T.H. 10 (0-5,000 r.p.m.)

ALL FOR L.H. OR R.H. DIRECTION OF ROTATION

PRICE (complete with strong case and full range of accessories) **£14.14.0**
postage and packing extra.

POST THIS FOR FULL DETAILS

Please send full details of your HAND TACHOMETERS

NAME ____________________

ADDRESS ____________________

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SMITHS INDUSTRIAL INSTRUMENT DIVISION

Chronos Works, North Circular Road, London, N.W.2. Telephone: GLAdstone 1136

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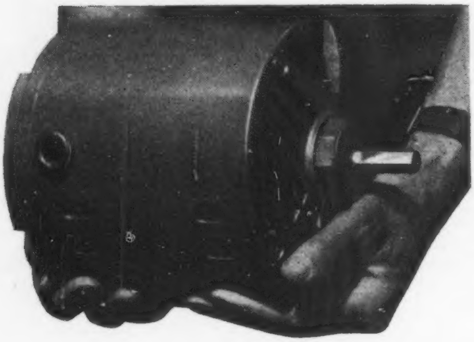
MERLIN



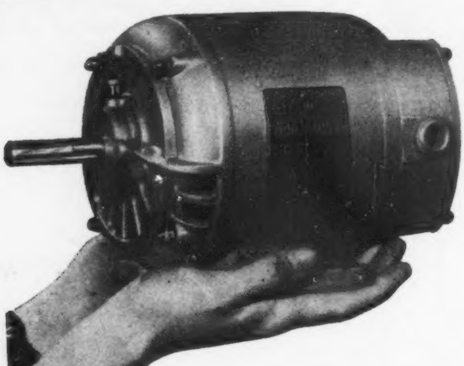
A modern motor for today's exacting and competitive markets. Made for single and three phase supply in a range of types with or without feet, flange or resilient mounting.

A washing machine type is available.

Size: Foot mounting $\frac{1}{4}$ h.p. 1420 r.p.m H. $6\frac{11}{16}$ × L. $10\frac{1}{2}$" × W. $6\frac{3}{4}$".

Washing Machine (no foot) Dia. $6\frac{11}{16}$ × L. $9\frac{1}{2}$".

BROOK FRACTIONAL HORSEPOWER ELECTRIC MOTORS



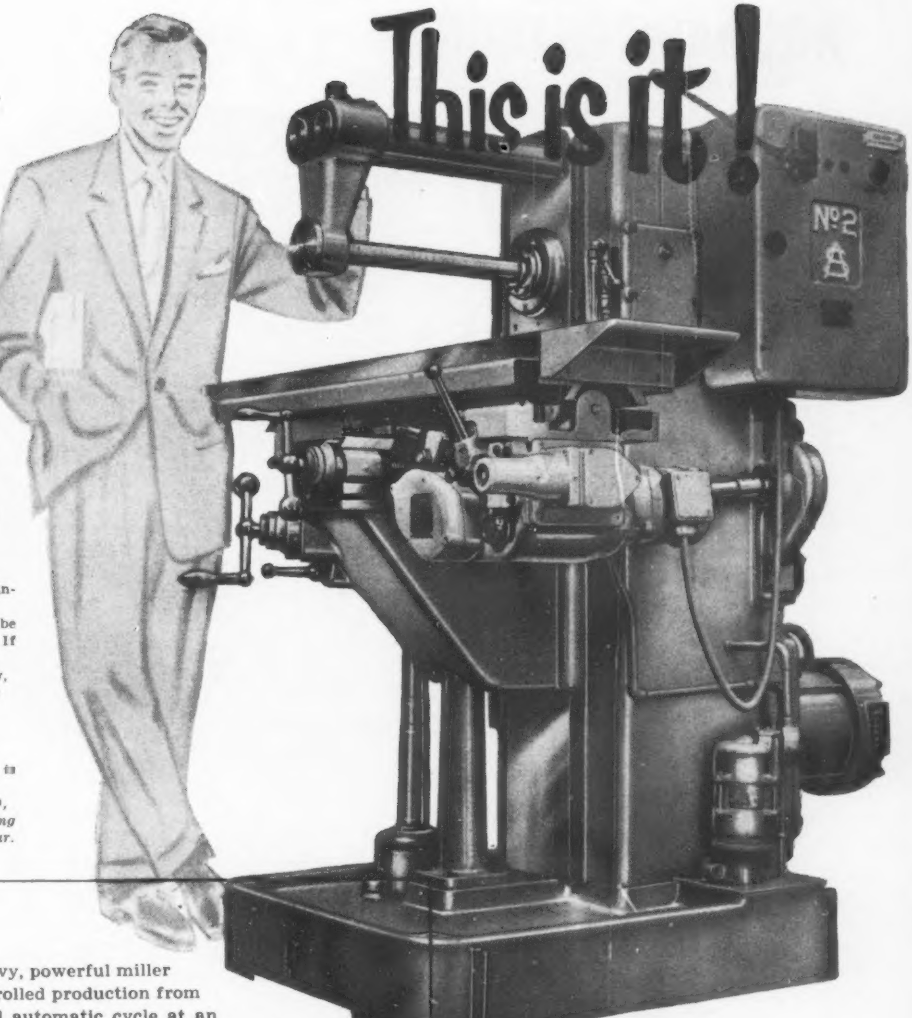
GRYPHON

The best fractional you can buy. A competitive variety of types and enclosures ensures a motor for every need. Single or three phase supply. All motors backed by service throughout the world.

Size S.175. $\frac{1}{4}$ h.p. 1420 r.p.m. H. $6\frac{11}{16}$ × L. $10\frac{3}{4}$" × W. $6\frac{3}{4}$".

BROOK MOTORS LIMITED
HUDDERSFIELD

56/25



the machine you cannot afford to be without !

Somebody said " You cannot do to-day's job on yesterday's tools and still be in business to-morrow." If you agree, how can you afford *not* to replace slow, out-of-date machinery by modern high-efficiency equivalents?

What this country needs is simple automatic-cycle tools like our model 2D, that save money by doing more work per man-hour.

Here you have a heavy, powerful miller giving you fast controlled production from a simple mechanical automatic cycle at an economic price. With its 23" automatic table traverse 20 table feeds and 12 spindle speeds it is capable of higher output per pound capital cost than either (a) a general purpose machine with its high labour wastage or (b) a too complicated and costly fully automatic machine.

Let us send you a brochure describing this machine fully.

Model 2B also available with normal automatic feed.

A & S Model 2D Production Milling Machine with automatic cycle.

A&S

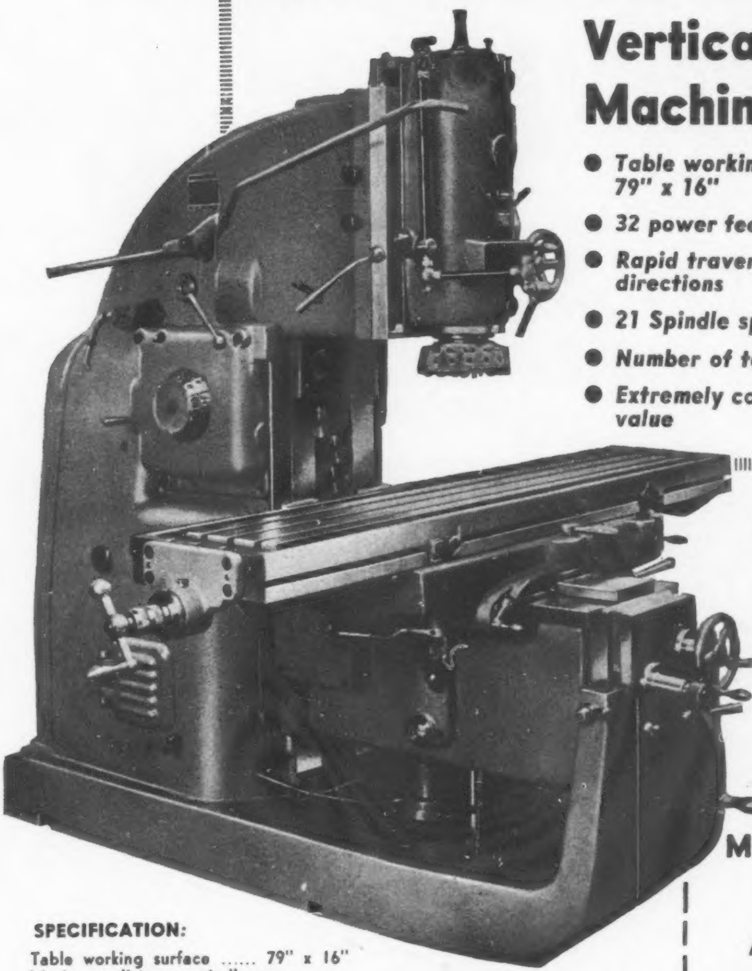
ADCOCK & SHIPLEY LIMITED
P.O. Box 22, ASH STREET, LEICESTER
Tel. Leicester 24154-6
Telegrams & Cables: Adcock, Leicester

Built up to a standard—not down to a price

GIEWONT No. 4

Vertical Milling Machine . . .

- *Table working surface 79" x 16"*
- *32 power feeds to the quill*
- *Rapid traverse in all directions*
- *21 Spindle speeds*
- *Number of table feeds 32*
- *Extremely competitive value*



MODEL 4 FYA

DELIVERY EX STOCK

UNIVERSAL MODEL 4 FWA ALSO AVAILABLE EARLY DELIVERY

SPECIFICATION:

Table working surface	79" x 16"
Maximum distance spindle nose to table	20"
Table traverse: Longitudinal ...	42"
Transverse	15¾"
Vertical	14"
Vertical traverse to spindle head	6"
Spindle speeds (21) ...	18-1300 r.p.m.
Approx weight	5 tons

EXCLUSIVE DISTRIBUTORS IN THE UNITED KINGDOM

RIGHT OPPOSITE NORTH ACTON STN.

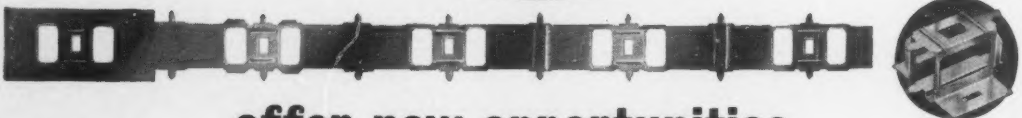
ELGAR MACHINE TOOL COMPANY LIMITED

172-178 VICTORIA ROAD · ACTON · LONDON W3 · Telephone ACORN 5555

Midlands Showroom: 1075 Kingsbury Road, Birmingham 24

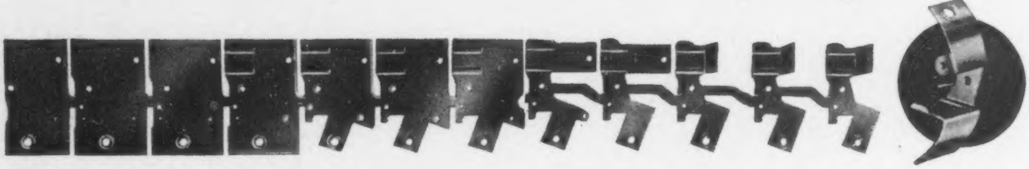
NRP

BRITISH-BUILT MULTI-SLIDE MACHINES



offer new opportunities

to produce *Intricate Stampings*



automatically *and cheaply!*

Most stampings, from simple brackets to intricate parts, which previously required operations on several presses, each with its own operator, can now be produced automatically with great accuracy, at high speed, on *ONE* British-Built U.S. Multi-Slide Machine. If you use a number of presses to produce stampings or if you use progression tools for parts made from coiled material up to $3\frac{1}{2}''$ wide, here are reasons why we are almost certain to be able to send you a most interesting proposal.

1. The extreme accuracy of the feed employed and the fact that bending tools can be adjusted independently makes it much easier to obtain a high quality part.
2. Sturdy construction of machine and its attachments as well as instantaneous braking through monitoring devices, increase tool life and reduce risk of tool breakages.
3. Material is saved because no extra material width is usually required either for piloting or side-cropping. The developed blank is in continuous strip, *not* held in a material webbing which becomes scrap. Material savings up to 25 per cent. are possible. In some cases production can be doubled by making two components from one strip.

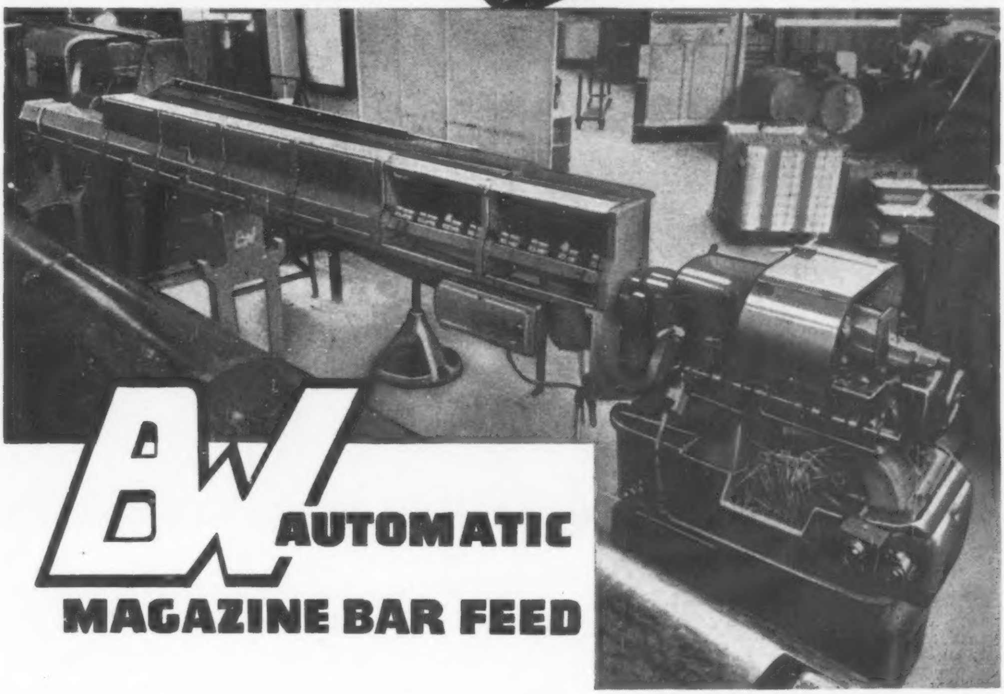
ROCKWELL
MACHINE TOOL CO. LTD.

For further particulars write or telephone TODAY

WELSH HARP, EDGWARE RD., LONDON, N.W.2. TEL: GLADSTONE 0033

ALSO AT BIRMINGHAM—TEL: SPRINGFIELD 1134/5 • STOCKPORT—TEL: STOCKPORT 5241 • GLASGOW—TEL: MERRYLEE 2822

OUTPUT INCREASED BY 80% ON THIS USING /



AW AUTOMATIC MAGAZINE BAR FEED

- TIME TO LOAD A 10' BAR — 4 SECS.
- OCCUPIES THE MINIMUM FLOOR AREA
- OBTAINABLE FOR EITHER 10' OR 12' MAX. LENGTH BARS
- AUTOMATIC EJECTION OF SHORT ENDS

DETAILS FROM:—

BROWN & WARD (TOOLS) LTD.

HATHERTON LANE : LEAMORE · WALSALL : STAFFS

PATENT APPLIED FOR

At Messrs. Tecalemit Ltd. Plymouth, the average daily production of Piston Rods, as illustrated above, for one of their range of Grease Guns was 2,200 pieces.

The installation of a BROWN AND WARD Automatic Bar Feed to the OOG. Brown and Sharpe Automatic producing these items has resulted in an increase in the output of 4,000 pieces per day, an increase of over 80%.

The economy which can be effected by this efficient but competitively priced unit cannot be overlooked when considering the potential operating efficiency of your automatic bar machines.

Send for details now ! !

WILD-BARFIELD A.H.F. equipment at

LOCKHEED

HYDRAULIC BRAKE CO.

A battery of three Wild-Barfield A.H.F. $7\frac{1}{2}$ kW. equipments issued by Lockheed Hydraulic Brake Co. at their Leamington factory for induction soldering tanks to brake master cylinders. Many other industrial concerns have found that Wild-Barfield induction heating speeds production, saves space and offers savings all along the line. Our engineers will be glad to supply further details and explain how Wild-Barfield A.H.F. equipment can help you.

WILD BARFIELD AHF

Induction heating speeds production

WILD-BARFIELD ELECTRIC FURNACES LIMITED

ELECFURN WORKS, OTTERSPOOL WAY, WATFORD BY-PASS, WATFORD, HERTS. Telephone: Watford 6091 (8 lines)

W874

When answering advertisements kindly mention MACHINERY.


SEE THE
SPRING
YOU NEED HERE ?
Cut production costs with TERRY Wire Circlips (Square Section)
We make first-class Flexible Shaft too. May we quote you?
No? Well, it would take all the pages of this magazine—and a lot more—to show in full the immense range of TERRY'S ASSORTED SPRINGS in all their variety—compression, expansion, heavy, light, long, short, any gauge you want. But in our BOXES OF ASSORTED SPRINGS you'll certainly find the very spring you've been looking for. Why not let us send you our full illustrated list of BOXES—post free?
No. 757. Extra Light Compression, 1 gross Assorted, 1/8" to 3/8", 1/2" to 2" long, 27 to 20 S.W.G. 15/- each.
No. 98A. 3 doz. Assorted 1" to 4" long, 1/2" to 3/4" diam., 19G to 15G. 5/6 each.
No. 758. Fine Expansion Springs. 1 gross Assorted 1/8" to 3/8", 1/2" to 2" long, 27 to 20 S.W.G. 15/- each.
TERRY'S
ASSORTED SPRINGS
No. 388. 1/2 gross Assorted Small Expansion Springs. 3/4" to 1 1/2". 18G to 21G. 9/6 each.
HERBERT TERRY & SONS LTD. REDDITCH, WORCS.
(Makers of quality Springs, Wireforms & Presswork for over 100 years)
No. 753. 3 doz. Assorted Light Expansion 1/4" to 1/2" diam., 2" to 6" long, 22 to 18 S.W.G. 10/6 each.
No. 1024. 20 Compression Springs 12" long. 1/8" to 1/2" diam., 24G to 18G, suitable for cutting into shorter lengths; and 30 Expansions 1 1/2" to 12" long, 5/32" to 3/8" diam. 22G to 16G. 24/- each.
No. 760. 3 doz. Assorted Light Compression Springs. 1" to 4" long, 22 to 18 S.W.G., 1/4" to 1/2" diam. 6/6 each.
Interested in Spring Design? Send for 'Spring Design and Calculations'—Post Free 12/6
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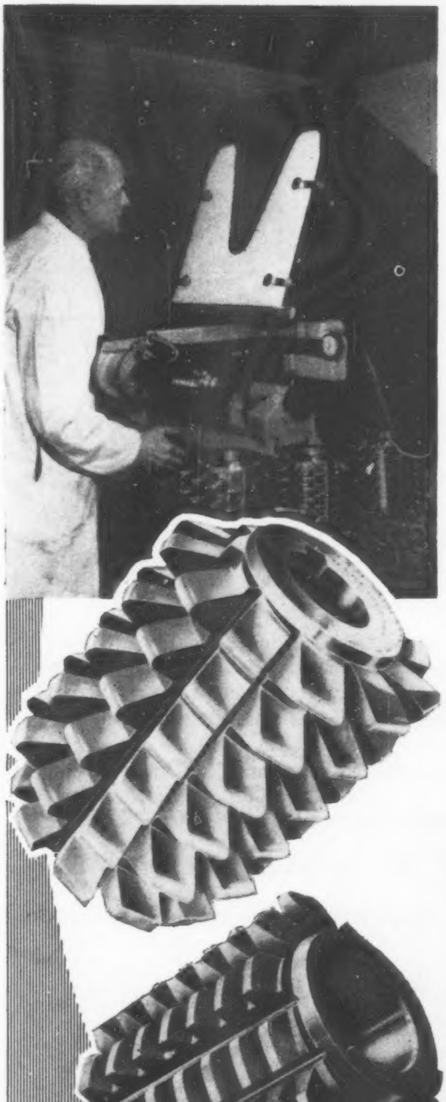
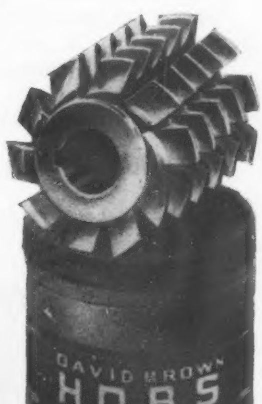


Your GUARANTEE

Whether you require standard hobs or "Specials" to suit your own particular requirements, David Brown facilities for production, heat treatment and inspection are your guarantee of maintained precision throughout the life of the hobs



WRITE TO-DAY FOR LEAFLET E.313.9.

THE
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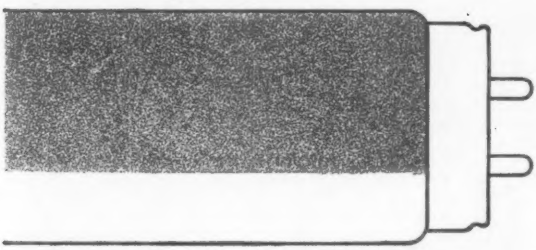
TOOL DIVISION
PARK WORKS HUDDERSFIELD



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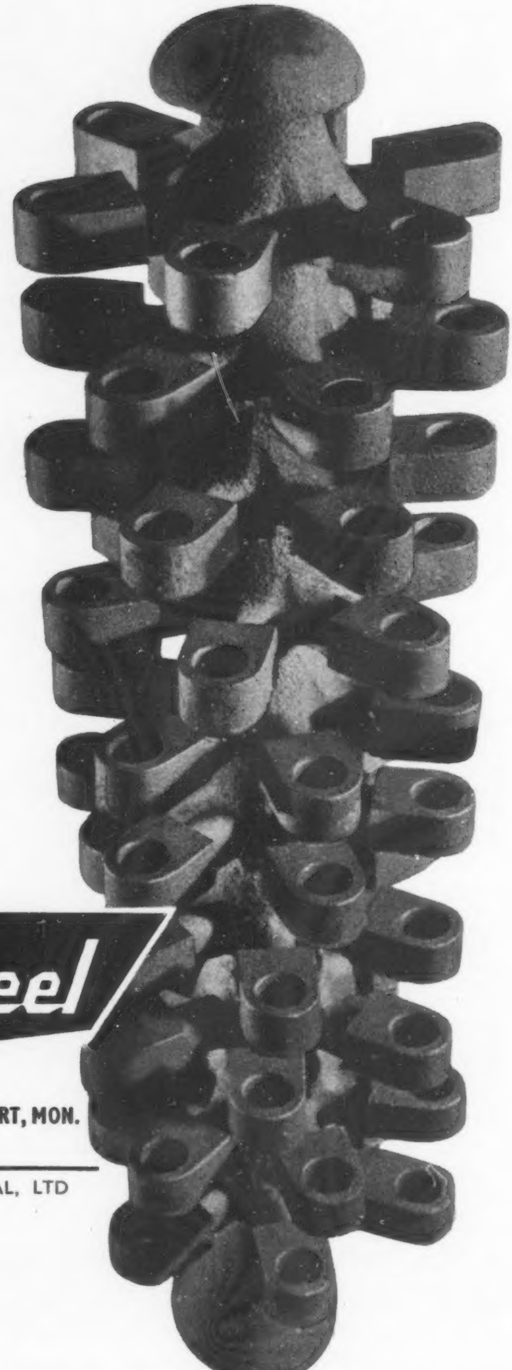
Whether you need big batches of small steel castings weighing a few pounds each, or individual castings of up to 30 cwt., BAKER'S OF NEWPORT can meet every demand for quality, surface finish, dimensional accuracy and rigid adherence to specification. Melting is by the latest type arc and induction furnaces and production is controlled from start to finish by metallurgical analysis and strict physical tests. Send us your enquiries.



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. . . collect oil coolant mist generated by high speed cutting, grinding and other machining operations

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The only British PRECIPITRON Oil Mist Filter is fabricated and tested by skilled craftsmen in our Manchester Works. It is the finest filter available, and its application is backed by the extensive experience and technical knowledge of Sturtevant engineers.

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High Speed for Heavy Duty is a feature of the extensive range of Skoda Lathes, available from 9¾in. to 63in., height of centres with distance between centres varying up to 80ft. approximately. Built of the highest grade materials and of first class workmanship, Skoda Heavy Duty Lathes combine a robust rigidity of design with easy and quick control of the machine from the operator's position.
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★ High Range of Spindle Speeds and Feeds.
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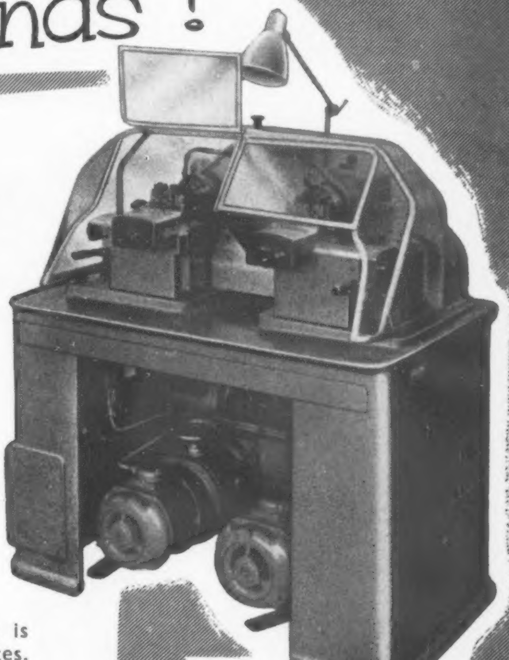
FOR UNUSUAL MACHINES

* Two operations 30 seconds !



KUMMER

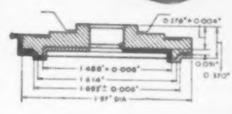
TWO-SPINDLE PROFILING CHUCKING AUTOMATIC

- **DUPLICATE POWER CONTROL FOR OPERATING HEADS INDEPENDENTLY**
- **TOOLS CAM CONTROLLED**
- **PROFILED PARTS MACHINED WITHOUT FORM TOOLS**

As the work example shows, the KUMMER is capable of really exceptional production rates. Tooling costs are low, and easy setting and short change-over times ensure big economies even on short runs. Intricate forms can be produced without special tools. Stepless spindle speeds from 410 to 3500 r.p.m. For non-ferrous turning a model is available with fixed speeds of either 2800 or 3500 r.p.m. Capacity for precision turned parts of any form up to 3.17/32" dia. with a maximum forward stroke of 25/32".

ALSO AVAILABLE: A COMPLETE RANGE OF TURNING MACHINES FOR THE WATCH-MAKING INDUSTRY AND WATCHCASE MANUFACTURERS.

FULL DETAILS FROM DEPT. M.S.



Ratchet Wheel for Calculating Machine. Brass. Cutting Speed :— 1700 f.p.m. Spindle Speed :— 3500 r.p.m. Two Operations :— 30 sec.

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BATTERSEA, LONDON, S.W.11
PHONE BATTERSEA 8888 (8 lines)

HABIB

Universal Tool and Cutter Grinding Machine

Type 12

Fitted with a swivelling table and universal movement to the wheelhead, this precision built, medium size machine is designed to meet many tool reservicing requirements, and enables a wide range of tool and cutter forms in H.S.S. or Carbide to be ground with speed and accuracy at low cost.

A sturdy machine bed provides full support to the transversal slides during maximum feed strokes and smooth positive table movements are ensured by dust proof prismatic slides with ball bearing motion. Controls are accessibly positioned to promote maximum operator convenience and high productivity.

Easily mounted fixtures facilitate rapid set-up and a full range of accessories are available for plain or universal grinding.

Sturdy bridge type construction.

Channelled castings facilitate coolant return.

All angles obtained direct from the wheelhead.

Independent type wheel arbor with collet type wheelhead spindle.

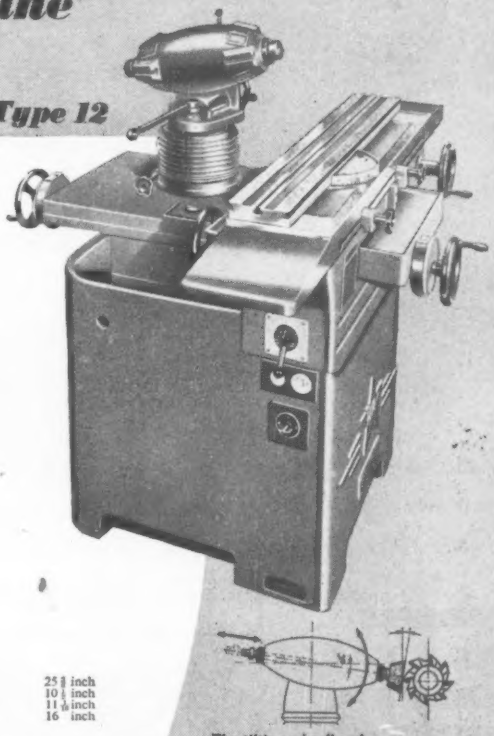
Unimpeded all round operation.

Duplication of controls at front and rear of machine.

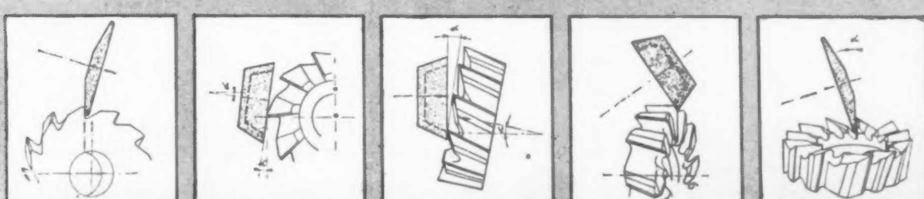
All attachments and adjustments readily clamped by hand.

BRIEF SPECIFICATION

Distance between centres	25 [illegible] inch
Vertical run of wheelhead	$10\frac{1}{2}$ inch
Maximum diameter between centres	$11\frac{1}{16}$ inch
Maximum Face Mill diameter	16 inch



The tilting wheelhead



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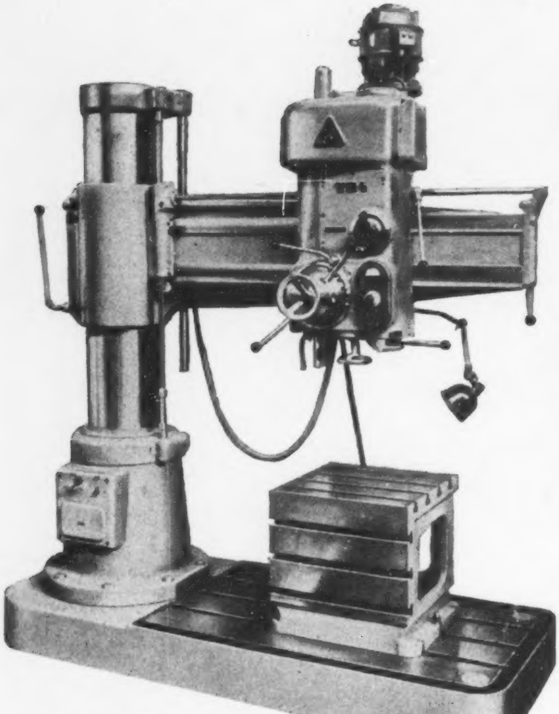

Model VR4

Other models early delivery

MAS

Radial DRILLING MACHINES

Consider these features:

★ Simplified and easy operation.

★ Patent locking of arm on column.

★ Single lever locks arm and head.

★ Drilling speeds selected and engaged by single lever.

★ Automatic disengagement of power feed at required depth.

★ Automatic lubrication of drilling head.

MODELS VR2 & VR4 IMMEDIATE DELIVERY

SPECIFICATION	VR2	VR4	VR6	VR8
Drilling Capacity in Steel	1in.	1 9/16in.	2⅜in.	3⅛in.
Drilling Capacity in Cast Iron	1¼in.	2in.	3⅛in.	4 5/16in.
Maximum distance centre line of spindle to column	31½in.	49in.	79in.	99 in.
Minimum distance centre line of spindle to column	9in.	12 5/8in.	17in.	19⅝in.
Maximum distance spindle nose to Box table	24in.	30in.	52in.	64in.
Maximum distance spindle nose to base	40in.	51in.	72in.	83in.
Vertical movement of arm on column..	21in.	28in.	34in.	41⅜in.
Taper in spindle	3 M.T.	4 M.T.	5 M.T.	6 M.T.
Spindle Speeds (12)	90-4,500	45-2,000	16-1,400	11-1,000
Spindle Feeds	(6) 85-850 cuts p. inch	(10) 16-1,020 cuts p. inch	(10) 13-820 cuts p. inch	(10) 11⅛-720 cuts p. inch

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GRAFFENSTADEN

VERTICAL TURRET LATHE

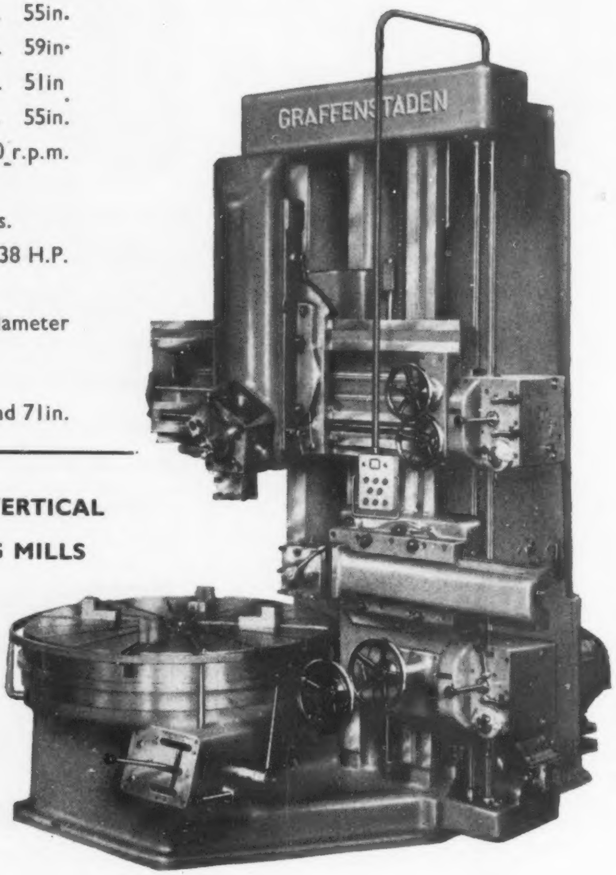
SPECIFICATION **TV 142**

Table diameter	55in.
Max. diameter turned	59in.
Max. height under cross rail ..	51in
or with taller column ..	55in.
Table speeds (12) ..	3—150 r.p.m.
18 rates of feed.	
Rapid traverses to all movements.	
Main motor	38 H.P.

OTHER SIZES AVAILABLE

With $31\frac{1}{2}$in., $39\frac{3}{8}$in. and 63in. diameter tables.

Maximum diameter turned 36in., 48in. and 71in.



Also DOUBLE COLUMN VERTICAL BORING AND TURNING MILLS

★ ***See this and other GRAFFENSTADEN machines at the MECANELEC Machine Tool Exhibition, Paris, SEPT 12-21 and at the 1st ITALIAN Machine Tool Exhibition, MILAN, SEPT 11-21***

Sole Distributors for the United Kingdom.

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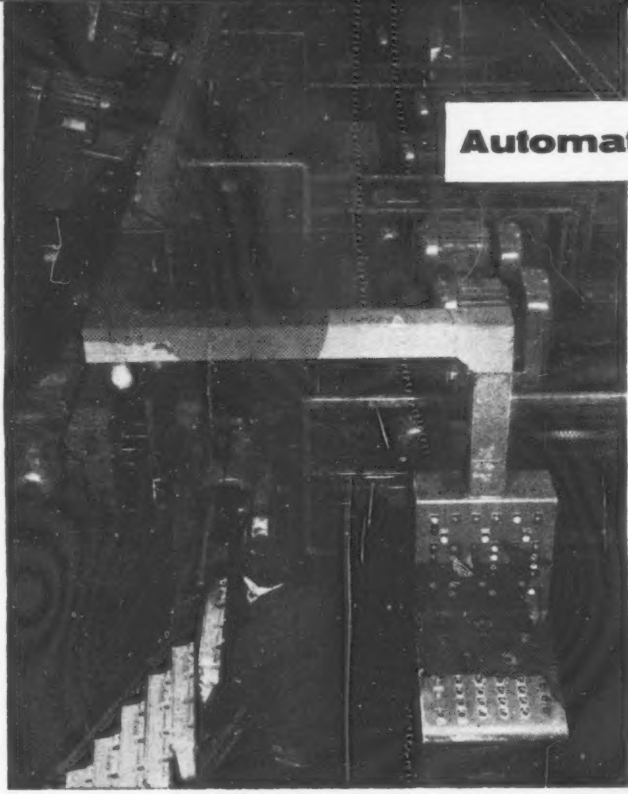
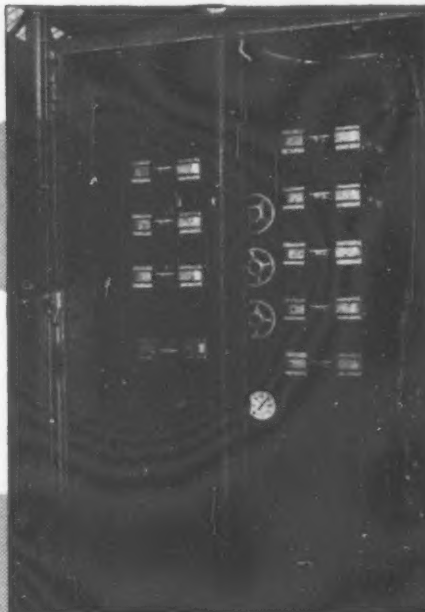


Automation at FORD

A first-class machine tool
is always a major asset
in any industry
but its efficiency
and rate of output are considerably increased
by first-class control.
That is why, in a highly competitive market,
Ford Motor Company Limited uses the
Asquith 47-Station Inline Transfer machine,
equipped with
VICKERS-DETROIT Oil Hydraulics
for drilling, boring, reaming and
tapping operations
on 4 and 6 cylinder tractor heads.



View from the loading end of machine. Vickers-Detroit hydraulic units ensure perfect control of sequence operations, and uniform precision of components on leaving the machine.

View of a Vickers-Detroit control unit at the unload end.

For further details please write for publication 1/42

British Made
VICKERS-DETROIT
OIL HYDRAULICS

by STEIN ATKINSON VICKERS HYDRAULICS LIMITED

S.A.V. HYDRAULICS 60 BUCKINGHAM PALACE ROAD, LONDON, S.W.1

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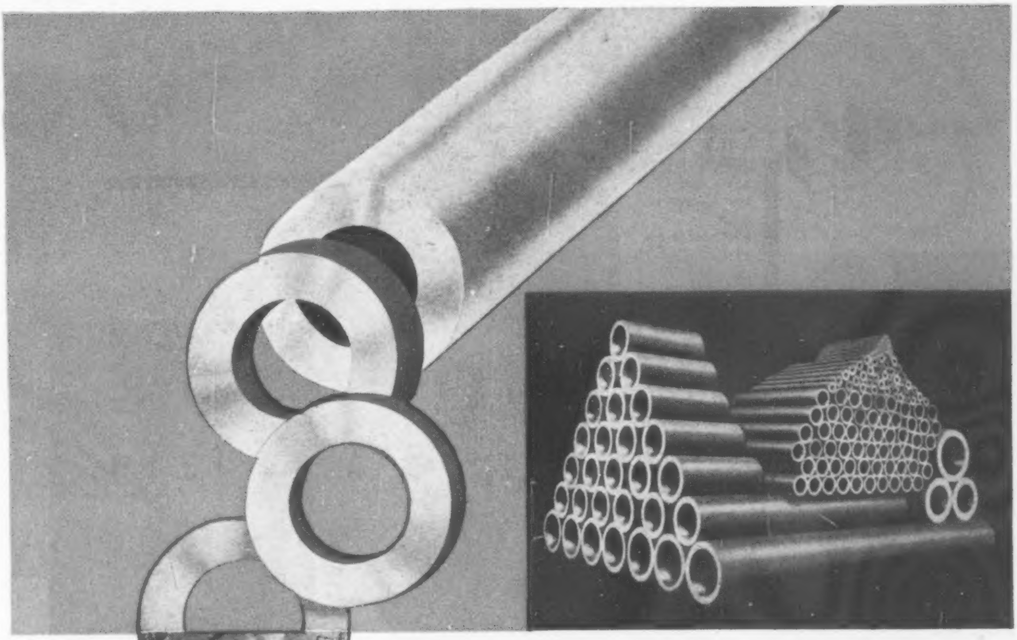

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There's no fancy price tag on Keetona Hollow Bored Bars. Why? Because Keetons turn them out by a highly economical process known as *deep hole drilling*—a process they've developed during twenty-five years in the business. With this process Keetons are well equipped to tackle even the smallest order and still make a low-priced job of it. If you want to compete with the next man, count on Keetona Hollow Bored Bars to bring down the cost.

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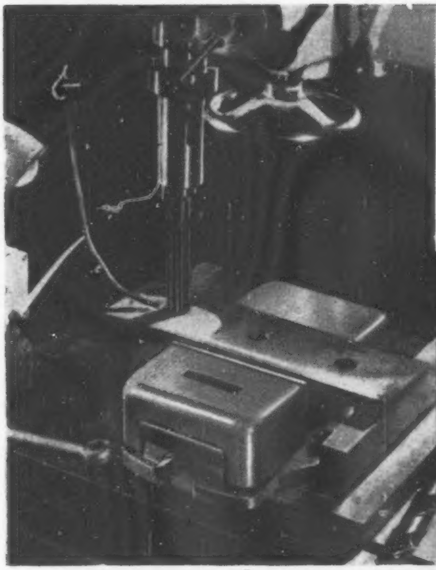
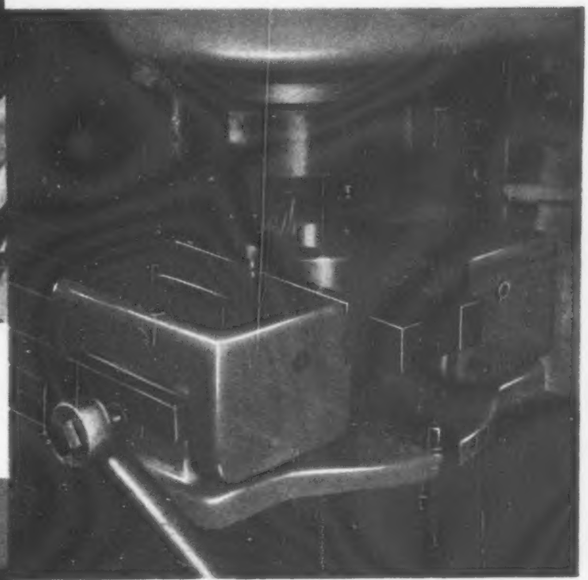
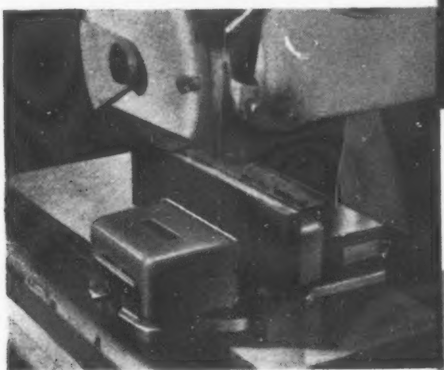


. . . . Whether you're Drilling, Reaming. . . . .



. . . . .Milling, Slotting



or Surface Grinding. . . . .

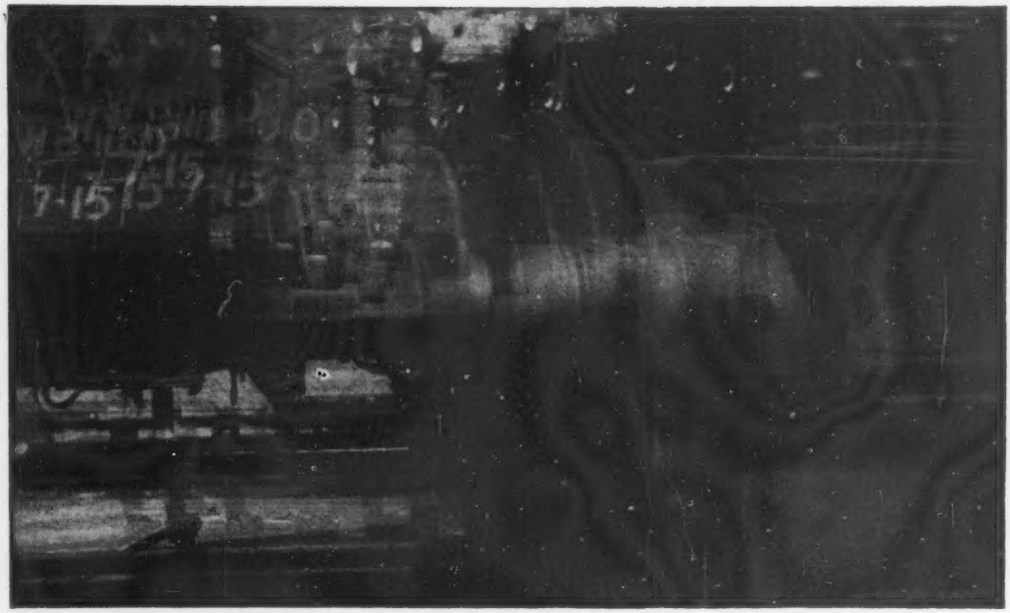
you can secure the work with a **DORMER**

DOWN GRIP MACHINE VICE

precisely!

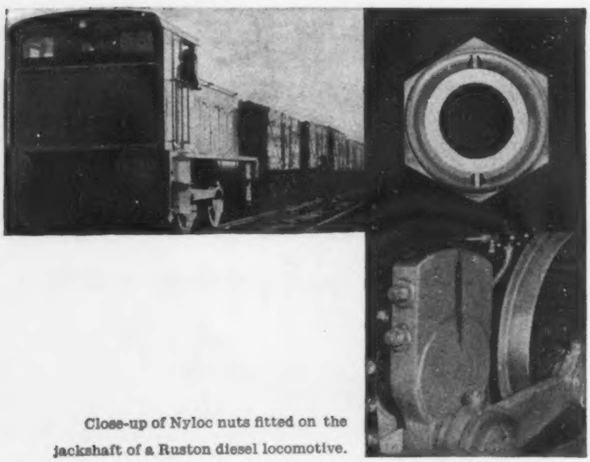
THE SHEFFIELD TWIST DRILL AND STEEL COMPANY LTD., SHEFFIELD, ENGLAND.

DORMER PRECISION MACHINE VICES ARE OBTAINABLE FROM YOUR USUAL ENGINEERS' MERCHANTS



Nothing rattles a nyloc

You can shunt away all day, but you won't budge a Nyloc nut. Not one thou. Jerk and jolt to your heart's content; the nylon insert holds it absolutely firm. On Ruston diesel locomotives, built for narrow-gauge haulage and shunting, Nylocs are fitted on the vital spot securing the jackshaft to the driving crank. No amount of vibration will shift them once they're on. Nylocs are as tough as they come. Other tough nuts are the Fibre and the all-metal Pinnacle nut. Drop us a line and we'll advise you which of these three self-locking nuts is best for your job.



Close-up of Nyloc nuts fitted on the jackshaft of a Ruston diesel locomotive.

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"Pre-select"

FOR GREATER OPERATING SPEEDS —FASTER PENETRATING CAPACITY

Shown in use at The Electric Construction Co. Ltd., Wolverhampton, this ARCHDALE mechanical 'Pre-select' is fully meeting our claims to cut production times to a minimum. Not only are penetration rates as high as power and rigidity can make them, but much valuable time is saved by convenient pre-selection from 16 spindle speeds, at any time, whether the spindle is running or stationary. Spindle speeds range between 15 and 1,500 r.p.m., and the six rates of feed, selected by a single lever, between 24 and 400 r.p.i.

N.B.—The illustration shows the drilling and spot facing of main fixing holes in end brackets for 250 b.h.p. electric motors.

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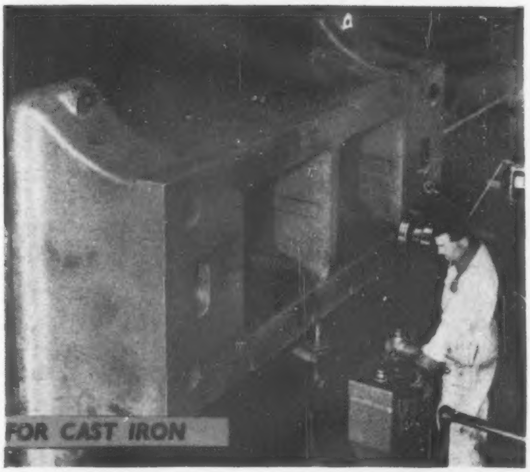
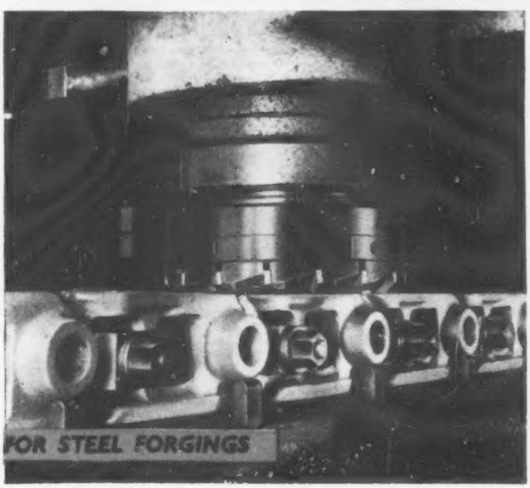


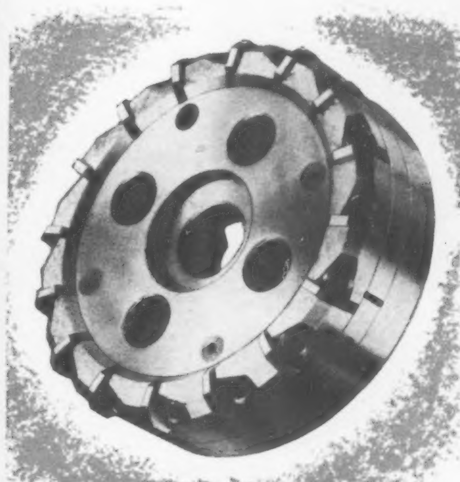


Prolite FUTUR MILLS

FACE MILLING CUTTERS

incorporating these 5 unique features

- All Rake and Clearance angles incorporated in the cutter body
- Sixteen cutting faces are available before regrinding is necessary
- No time is lost for blade regrinding
- Steel can be milled at high feed rates
- All inserts can be replaced without disturbing the tool setting



Home Sales: **PROTOLITE LTD.** *(a subsidiary company of Murex Ltd., Rainham, Essex),* **CENTRAL HOUSE, UPPER WOBURN PLACE, LONDON W.C.1.** *EUSton 8265. Telegrams: Prolite, Kincross, London*
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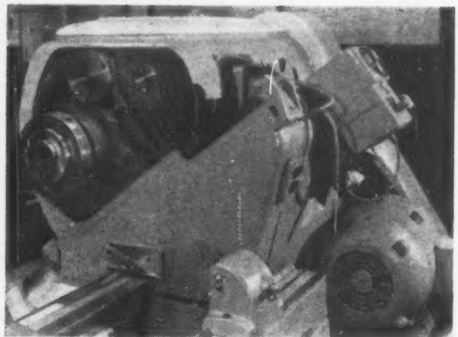
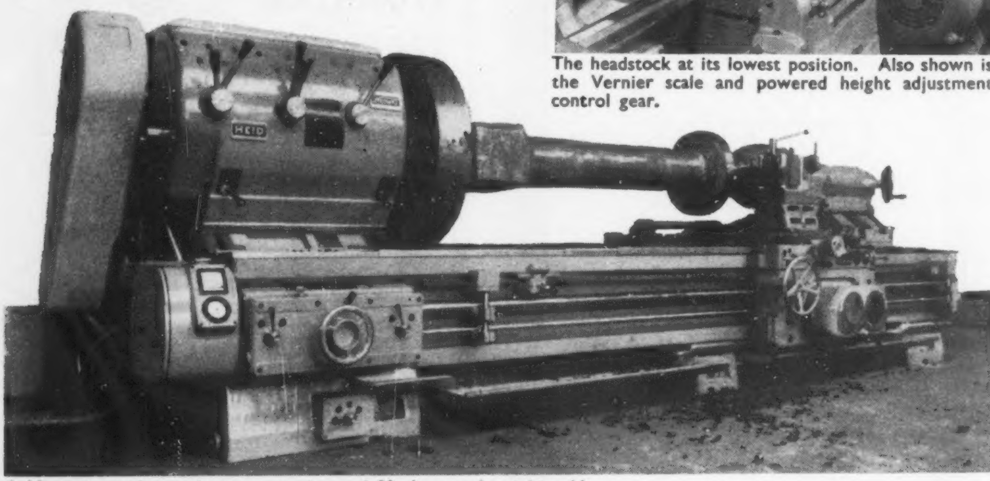
50% INCREASE IN DIAMETER CAPACITY

HEID "NEOMAT"
Copying Lathe Model VK56

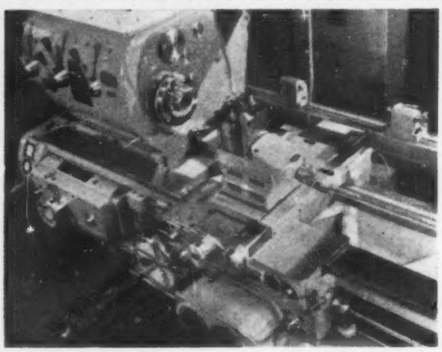
The only Lathe in the world manufactured with variable centre heights ($15\frac{3}{4}''$ to $22\frac{1}{4}''$) This adds 50% to the diameter capacity.



The headstock at its lowest position. Also shown is the Vernier scale and powered height adjustment control gear.



A Neomat copying a piston connecting rod 9ft. long and weighing $1\frac{1}{2}$ tons.



Some advantages of the Neomat include:

- ★ **Copy turning over the entire sliding and surfacing capacity.**
- ★ **The cutting forces always fall within the bedways giving a finer finish with no stress on the machine.**
- ★ **Any bedlength supplied to customers' requirements with one or more saddles copying simultaneously.**
- ★ **It can copy through 180 deg. by means of an easily-operated electro magnetic tracer.**

(*Left*) The saddle and headstock showing the controls, adjustable height toolpost and HEID electric copying system.

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'Phone: Midland 3431 (7 lines) Grams: Maxishape, Birmingham. Also at LONDON: 'Phone: Trafalgar 7224 (5 lines) and GLASGOW: 'Phone Central 0922

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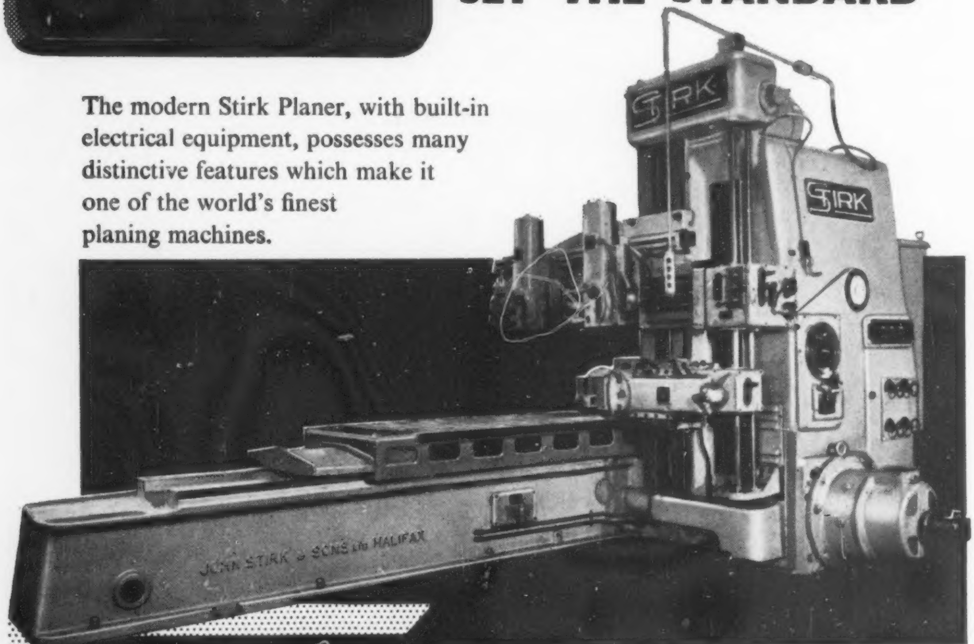
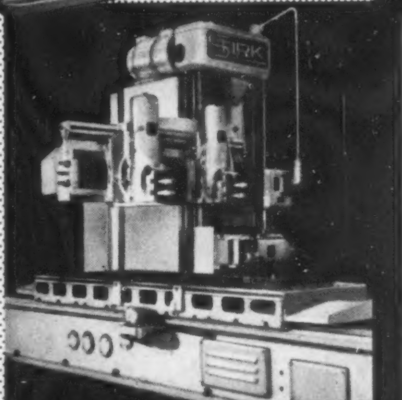
PLANERS
SET THE STANDARD

The modern Stirk Planer, with built-in electrical equipment, possesses many distinctive features which make it one of the world's finest planing machines.





The easy control and fine accuracy of the modern planing machine is due in no small measure to the continuous development of Stirk Planers. For more than fifty years, Stirk Planers have influenced the design and set the standard by which others are judged.

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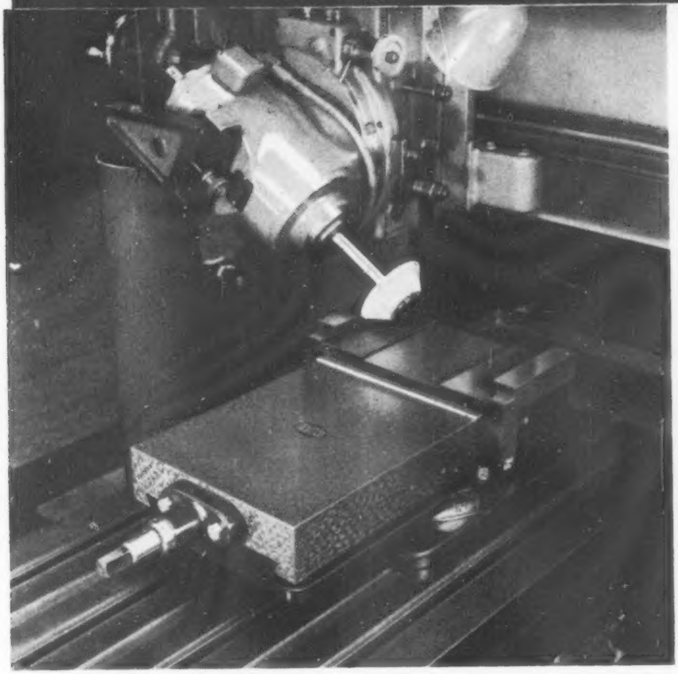
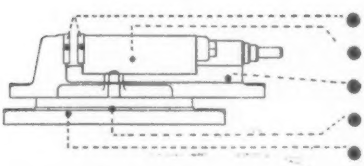


Grinding Vee Slides of drill jig using Abwood Machine Vice for ease of set-up. This set-up precludes any possibility of lift, thus ensuring all faces being square and/or parallel.

THE ABWOOD MODERN MACHINE VICE

FULL RANGE OF SIZES AND TYPES FROM 3" to 15"

VISUALISE WHAT AN IMMENSE SAVING THIS MEANS



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- SLIDING JAW MACHINED OVER THE WHOLE OF ITS SURFACE FOR USE OF SCRIBING BLOCK
- ENCLOSED SQUARE THREAD SCREW HARDENED ON THE END AND 'THRUST'
- MACHINE DIVIDED SWIVEL BASE INDEXED THROUGH 360°
- ALL CASTINGS IN HIGH TENSILE "MEEHANITE"

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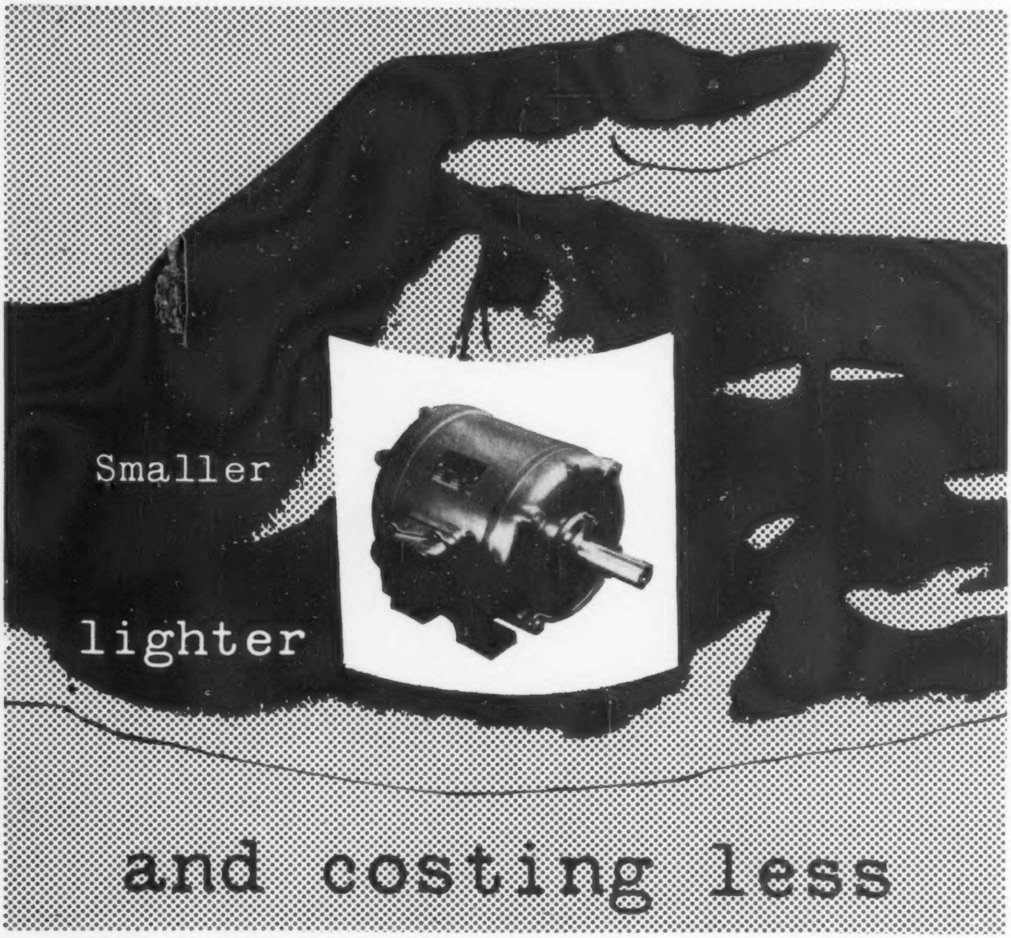
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Abstracts of Principal Articles

Aspects of Russian Engineering Industry P. 456

Russian engineering industry, and Soviet machine-tool building plants in particular, are served by a number of well-equipped and generously-staffed research establishments of which the Central Research Institute for Technology and Machine Building (TsNIITMASh) is one of the largest and most important. Founded in 1931, this institute has been considerably expanded since the second world war, and is one of the few research institutes in the U.S.S.R. which is qualified to grant scientific degrees. It has a total staff of 4,000 and is divided into four divisions, covering metallurgy, technological problems, machine design, and commercial affairs. Among the recent developments of the institute that are described in this article may be noted a new technique for making large shell moulds by the treatment of a sand-sodium silicate mix with carbon dioxide; a magnesium process for the production of spheroidal graphite cast iron; a recuperative hot blast cupola, with semi-automatic charging arrangements and radio-cobalt indication of the metal height; a special extrusion press for the production of turbine blades; a hot rolling method for the production of spiral bevel gears; milling cutters with high rake, clearance and helix angles; simple expanding reamers; and special equipment for fatigue testing and improving fatigue resistance by peening. (MACHINERY, 93—27/8/58.)

Kanthal-Oakley Automatic Coiling Machine for Resistance Spirals .... P. 470

The machine described is claimed to produce resistance spirals of exceptional accuracy, which may be stretched to form heating elements without causing variations in pitch or diameter. Close wound, space wound, double wound, or mixed-pitch spirals can be obtained. (MACHINERY, 93—27/8/58.)

Smooth Finishes Obtained by Roller Burnishing .... P. 471

The Chrysler Corporation, U.S.A., are employing multiple-roller burnishing tools to obtain smooth surfaces on torque-converter parts. These tools are employed on standard vertical drilling machines, and types suitable for operations on internal, external, and thrust surfaces are illustrated and briefly described. If uniform surface finish is not essential, the final work diameter can be accurately controlled by burnishing. (MACHINERY, 93—27/8/58.)

The Contribution of Brazing in Light Engineering .... P. 473

In a paper presented at the Conference on Technology of Engineering Manufacture, organized by the Institution of Mechanical Engineers, the author, Mr. E. V. Beatson, drew attention to the rapid advances, in recent years, in connection with all welding and brazing processes. He went on to point out that, for the best results, final selection of the assembly method to be employed should be made at the design stage. It was also explained that it may frequently be desirable to utilize a combination of two or more processes for a single assembly. Other sections of the paper were concerned, for example, with design and development, brazing alloys, brazing techniques for stainless-steel and Nimonics, and the high frequency and resistance brazing methods. By reason of continued progress, it is desirable to review component designs periodically, because a process which has proved unsatisfactory at one stage may, as a result of further development, provide a better solution at a later date. Reference was made to the exacting requirements, as regards oxygen and moisture contents, for hydrogen and hydrogen/nitrogen atmospheres, as employed in brazing stainless steel. (MACHINERY, 93—27/8/58.)

Autoflow Machine for Automatic Vapour Blasting Treatment .... P. 482

This article describes a new machine introduced by Abrasive Developments, Ltd. for the automatic vapour blasting of components which are loaded into a barrel together with a number of rubber balls for promoting movement. Two guns in the barrel can provide whatever degree of treatment is required, and the process is controlled by an electric timer. (MACHINERY 93—27/8/58.)

Die Making Facilities at the Works of Fonderpress, Bologna .... P. 491

In this article, which is the second of two concerned with the activities of Fonderpress Di Gamberini Tagliavini & Co., Bologna, Italy, some of the plant installed in the die-making establishment of the company, about 50 per cent of the output of which is supplied to outside customers, is first described. A number of Deckel die-sinking machines is employed for cavity and other work, and the plant also includes a Wolters vapour blasting unit and a special die try-out machine constructed by the company. Some interesting dies in course of production are then discussed, including one for casting an aluminium alloy combined crankcase and finned cylinder, and another for the base casting on which the crankcase is supported. Individual plate-type inserts are employed for those portions of the die in which the fins are formed, and offer a number of advantages as compared with solid construction. Another casting of similar type, for a smaller air-cooled engine, and the die in which it is made, are also discussed. (MACHINERY, 93—27/8/58.)

IN FORTHCOMING ISSUES

Producing the Vauxhall Victor—Economical batch-machining of large parts—Assembling Jones & Shipman grinding machine spindles and work-heads

The Extending Field for "Gun Drilling"

For the great majority of manufacturing operations which involve the machining of holes from the solid, twist drills of standard or modified forms are employed, and provided that they are applied under suitable conditions, and correctly re-sharpened when necessary, very satisfactory results are normally obtained. In view of the importance of drilling as a production process, moreover, considerable research has been carried out in recent years with the object of obtaining improved performance as regards, for example, rate of penetration, drill life, and accuracy and straightness of drilled holes. As a result of these investigations, special designs have been introduced from time to time, which are claimed to offer considerable advantages in certain circumstances. Good performances have also been reported for carbide tipped twist drills in some instances, despite the fact that cutting conditions at the point appear to be rather unfavourable to this material. As far as can be ascertained, however, such drills have not yet found any very extensive application.

One of the great virtues of the twist drill lies in its inherent provision for extraction of swarf from the hole, but this action naturally tends to break down when certain ratios of hole depth to diameter are exceeded, particularly in some work materials. Holes of very considerable depth are, of course, successfully produced with twist drills, but it becomes necessary to perform the operation in stages, with periodic withdrawal of the tool to provide for swarf removal and permit entry of cutting fluid. A point is reached, however, where the use of twist drills is no longer practicable, and the alternative, well-established technique, by reason of its early associations, is frequently known as "gun drilling." This process is characterized by the fact that cutting oil, under high pressure, is constantly delivered to the point of the tool which is thus cooled and lubricated, and the return flow of oil serves to carry away the swarf.

As originally applied, this method served its purpose, but rates of penetration, with the steel cutting bits employed, were rather slow, and the fact that it was customary to drive the work, and employ a non-rotating tool, imposed fairly drastic restrictions on the nature of the components that could be effectively handled. During the past twenty years, however, there have been spectacular changes. Carbide tips were introduced and were found to perform very satisfactorily, and tool design became the subject of intensive study with the result that penetration rates were greatly increased. It was also discovered that for certain operations a trepanning process could be used with advantage. With this method, not only is less material reduced to swarf, but the central core may provide additional guidance for the tool and thus assist in maintaining straightness of the bore. At first, trepanning was confined to bores of fairly large diameter, but it is reported that it has since been applied to holes as small as ⅜ in.

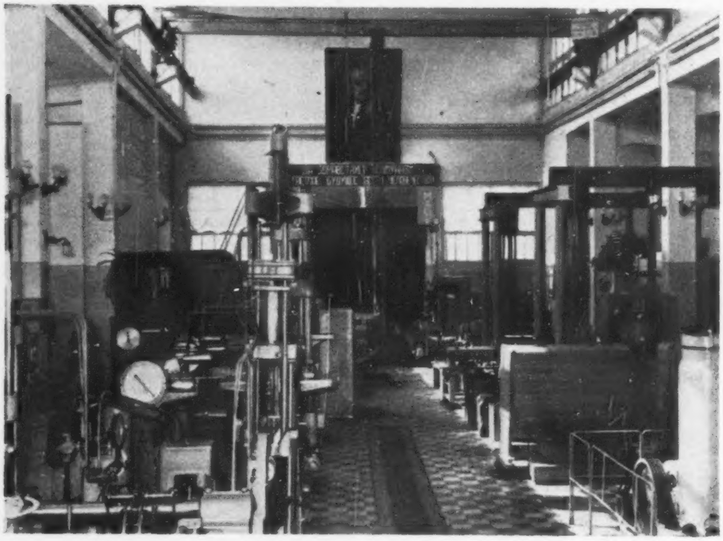
Although it is obviously somewhat more difficult to maintain a high-pressure oil supply to a rotating than to a stationary tool, this problem has been successfully solved, and the user is now offered a choice of designs for either full diameter drilling or trepanning, with the tool or work—or both—rotating. Accuracy of hole size and good surface finish have always been associated with gun drilling, and these advantages have been retained and accentuated with the latest tool forms, whereas holes produced with twist drills frequently require reaming or other finishing operations. For this reason, and because gun drilling with rotating tools can be carried out on standard machines at high production rates, the process is no longer confined to long holes, but must also be considered for a variety of operations involving medium length and short bores.

Some of the possibilities in this field were discussed by Mr. Herbert Gregg during the course of a paper read at this year's annual meeting of the American Society of Tool Engineers. In one instance a ¾-in. diameter trepanning tool—or pin-cutting tool as the author terms it—was employed for drilling 3⅝-in. long holes in bronze bushings at a speed of 4,500 r.p.m. and a feed of 35 in. per min. It is stated that the holes were produced to limits of -0 $+0{\cdot}0005$ in. with a surface finish of 10 to 15 micro-inches. Another example quoted was concerned with the drilling of 2¾-in. long by 0·564-in. diameter holes in a block of SAE 1020 steel. A centre-cutting single flute tool was employed for this operation at a speed of 3,800 r.p.m. and a feed of 6 in. per min. Hole diameter was held to limits of $\pm 0{\cdot}001$-in., and surface finish to 40-70 micro-inches.

Investigations have also been carried out to

(*Continued on page 506*)

Aspects of Russian Engineering Industry



Some Impressions Based on a First-hand Study of Soviet Plants

In this series of articles* devoted to the engineering industry of the U.S.S.R., the growth of the Russian machine-tool industry has been discussed, and some of the latest types of production equipment have been reviewed. Reference has been made to the organization, methods and products of the Ordzonikidze and Sverdlov machine tool plants, and of the Moscow Cutting-tool Works. In connection with these plants, it was mentioned that a close liaison is maintained with the various research institutes that have been established for investigations into metal-working techniques and equipment, and in this article, one of these establishments—the Central Research Institute of Technology and Machine Building—will be considered, and some of its activities described.

CENTRAL RESEARCH INSTITUTE OF TECHNOLOGY AND MACHINE BUILDING

Generally known by the abbreviated name of TsNIITMASh, the institute occupies a site of more than 7 acres in Moscow, and is one of the largest research establishments in the Soviet Union. It was founded in 1931, but was greatly expanded to its present size after the end of the second world war. The work of the institute covers a wide field, but most of its activities are aimed in three directions, namely, the investigation of new machine-building materials, including those for gas and steam turbines and other prime movers; the development of new technological processes for the whole field of metal-working, from casting and forging techniques to heat-treatment and metal-finishing; and the design and construction of new heavy metal-working machinery, for example, rolling mills.

A total of 4,000 people is employed in all branches of the institute, which has its own workshops, where some 400 men are engaged in building experimental machines and equipment. The institute also controls the Perovsky Machine Plant, with some 1,000 employees, where prototype machines are built and new equipment and methods are tried out under workshop conditions. There is a large design office with a staff of 700, and among the ancillary departments may be noted a large technical information section, a technical library, and a printing house for the production of a wide range of technical books and other literature, including a monthly magazine, published by the institute. The income of the institute is derived from two sources, about 60 per cent being provided by a Government grant, and the remain-

* MACHINERY, 93/4–2/7/58; 93/137–16/7/58; 93/288–6/8/58; and 93/344–13/8/58.

ing 40 per cent by Soviet industry, in payment for contract research.

ORGANIZATION OF THE INSTITUTE

There are four main divisions of the institute which are concerned with metallurgy, technological problems, design, and commercial affairs. Each division is under the control of a senior member of the staff, who has gained a doctor's or candidate's degree, and it may be of interest to note that the director responsible for the technical problems division, Mr. N. N. Zorev, contributed a paper* to the recent Conference on Technology of Engineering Manufacture, organized by the Institution of Mechanical Engineers in this country. The divisional directors are responsible to the director of the institute, Prof. E. P. Unksov, D.Sc., and the head of the commercial division, who is an engineer of wide experience and business ability, acts as deputy director of the institute, and conducts all contract negotiations with industry. Each division has one or more chiefs of laboratory, who possess the same general qualifications as the director, but are somewhat less experienced. The positions of deputy director, divisional director, and chief of laboratory are competitive, and are filled on the basis of a secret ballot by the scientific council of the institute (to which reference will be made later). In the selection of candidates for these positions, the council take into account the scientific qualifications of the applicants, the quantity and quality of original scientific work that they have undertaken, and their qualities of leadership and organizing ability.

The rest of the staff in each division is divided into the following grades, in order of seniority:—senior scientific worker, who must have gained a second science degree; junior scientific worker, who must hold a first science degree; engineer, who must have graduated after a recognized course at a higher institute for scientific education; technician, who must have been educated at a special technical establishment; and laborant, who must have had a high-school (grammar school) education. Before an engineer can advance to the grade of junior scientific worker, he must follow a course of post-graduate studies, and present—and defend—a thesis before the scientific council of the institute.

More than 800 members of the institute staff are studying at night universities, and the institute has its own post-graduate school, where there are some 80 students. Each course is divided into theoretical and practical studies, three days of each week being spent at lectures and three in the laboratories. Students receive a salary of 1,000 roubles per month†, this amount being half the salary of a junior scientific worker. It may be pointed out here, that each scientific and engineering degree in the U.S.S.R. entitles the holder to a standard increase in salary, a doctor's degree conferring a salary increase of 1,000 roubles per month. Each department of the institute, except the post-graduate school, has its own carefully organized training programmes.

The metallurgy division is divided into seven departments, which are concerned with the development of constructional steels, the development of heat-resisting steels, corrosion, strength of materials, chemical and physical investigation of metals, development of precision instruments and equipment, and testing. More than 1,500 people work in the various departments of this division, and this number includes 10 holders of doctor's degrees, 150 holders of second science degrees, and 700 holders of first degrees. In the technological problems division, there are departments for the investigation of problems associated with foundry work, forging, welding, high- and low-frequency heating, machining processes, and the manufacture of gears. The design office and workshops, already mentioned, form part of the design division. When necessary, as many as 150 people may work simultaneously on one investigation, and the institute sends technical teams to all parts of the Soviet Union to carry out on-the-spot investigations in factories and plants, and to advise on the solution of manufacturing problems. In this way, direct contact is maintained with more than 500 works and manufacturing establishments, and among current investigations may be noted those in connection with steam and hydro-electric turbines, large presses, and mechanical excavators.

TsNIITMASh is one of six institutes in the Moscow area which have power to grant scientific degrees, and only a comparatively small number of institutes in the U.S.S.R. are authorized for this purpose by the Government. The degrees are awarded by the scientific council of the institute, which has 24 members, not all of whom work in the institute. There are two members, for example, from the Soviet Academy of Sciences, and in all there are 16 doctors on the council. Degrees are awarded as the result of a secret ballot, after the council have listened to the presentation and defence of a thesis by the applicant. Any Soviet citizen who has graduated from a higher educational establishment can apply to present a thesis.

* Certain Results of Work in the Field of the Mechanics of the Metal Cutting Process.

† The standard rate of exchange is 11 roubles to the £1 but many authorities consider that 35 roubles to £1 provides a more realistic comparison.

NEW SHELL-MOULD MAKING TECHNIQUE

Among the new processes that have been developed by the foundry department of the metallurgy division, is a technique for making high-strength moulds of considerable size by a combination of the shell-moulding and carbon dioxide hardening processes. The special moulding machine that has been built to utilize this technique is shown in Fig. 1, and is installed at one end of the main bay of the foundry department, which has an area of 13,000 sq. ft. The machine is built into a pit in the shop floor, and comprises a central air-operated press, and two loading stations. Rails connect the loading stations and pass between the crown of the press and the ram, which is located in the pit below. Trolleys move on these rails, and each has provisions for the attachment of the pattern plate, whereon a half-pattern is secured. One of the trolleys is indicated at *A* in Fig. 1, and the half-pattern is just visible at *B*. Each trolley has four ejection plungers, as at *C*, which slide in bearings bolted to the trolley frame, and the plungers project downwards, between the rails. When the trolley is in the position shown—at the outermost limit of its travel—the plungers are located immediately above the ends of the arms of the spider *D*. This spider is carried on the piston rod of a large air cylinder in the pit, and at the end of each arm there is a threaded member, in alignment with one of the plungers, this member being adjustable for height.

Moulds are made in large steel flasks, to facilitate subsequent transport and clamping, and one such flask may be seen at *E*, in position on top of the pattern plate of the trolley *A*. A charge of a sand and sodium silicate mix, of a predetermined weight, is loaded into the flask, and is distributed evenly over the half-pattern. Then, the trolley is advanced into the central press, where it is located beneath a reinforced rubber diaphragm in the crown. Next, the trolley is raised to bring the flask —also the upper portions of the sand mix, covering the projecting members of the half-pattern—into contact with the diaphragm. With the trolley held in this position, air at a pressure of 90 lb. per sq. in. is applied to the diaphragm, so that the sand mix is compressed around the pattern.

Air pressure on the diaphragm is maintained, and a supply of carbon dioxide gas is connected, by a valve on the press, to the hollow top member of the trolley, and passes through the sand mix by way of holes in the pattern plate. Gas is delivered for a period that has been determined from trials. At the end of this time, the gas supply is cut off, and the trolley is returned to position seen in Fig. 1. Under the action of the gas and the pressure applied by the diaphragm, the sand mix is formed into a hard, strong shell, about 2¼ to 3½ thick, and the time required for the complete shell-making cycle is 3½ min. About 40 to 45 lb. of carbon dioxide is used per ton of sand mix, and for this particular shell, the weight of gas was 4½ lb.

The equipment shown is suitable for making shell moulds measuring 6 by 3 ft., using patterns up to 14 in. high. Since no heat is used, with its attendant problems, it is considered that very much

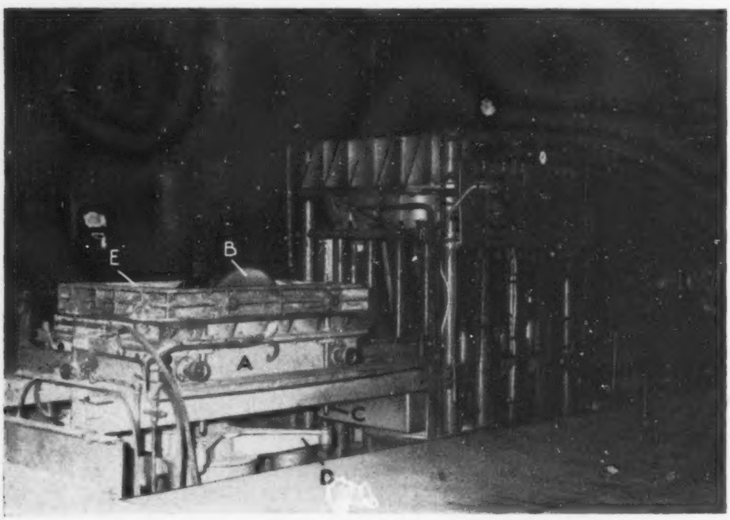


Fig. 1. This Special Equipment has been Developed by the Foundry Department of the Russian Research Institute TsNIITMASh for the Production of Large Shell Moulds by the Treatment of a Sand-Sodium Silicate Mixture with Carbon Dioxide Gas

larger shells could be made without difficulty, the only limitations on size being those associated with the construction of a rubber bag press of the necessarily large capacity. The moulds produced are very strong, and will easily carry the weight of a man, when only the flask is supported.

Half-round openings are provided in one side of each flask to permit the formation of feeders in the mould. For pouring, the two flasks containing the matching half shell-moulds are mounted in a special horizontal press, with the feeding openings uppermost. This press was built in the institute workshops, and is constructed by welding from steel plate and sections. It incorporates a steel framework base, with pairs of vertical angle-section guide-members to position the flasks initially. Each guide-member of a pair at one side of the press is curved outwards at its upper end to provide a lead-in for the flask. Rails are mounted on top of the base framework, and extend for the length of each long side. Weld-fabricated steel box structures are supported on the rails by means of rollers at either side, and one pair of rollers on each box is coupled to a large hand-wheel, in order that the boxes may be traversed towards and away from each other. When the boxes are in their innermost setting, their inner sides, which are open, are just clear of the two flasks containing the shell moulds. The boxes can be secured in this position by the insertion of pins vertically through matching holes in lugs that project from each box.

The boxes house large rubber air bags, and by connecting these bags to the compressed air supply when the boxes are at their innermost setting, the two flasks and half shell-moulds can be clamped securely together. A loosely-fitting fibre-glass blanket is fitted over the open end of each box in order to protect the rubber bag from damage by contact with the rough outer surface of the mould, and to reduce the transfer of heat from the molten metal.

MAGNESIUM PROCESS FOR SPHEROIDAL GRAPHITE CAST-IRON

Investigations concerned with the production of spheroidal graphite cast-iron by the magnesium process have been undertaken by TsNIITMASh, and the equipment shown in Fig. 2 has been developed. This equipment has capacity for making 1½ tons of spheroidal-graphite iron, and similar units with capacities of 5 and 10 tons have been built. Each unit takes the form of a drum-type ladle, with a steel shell and a refractory lining, and it is pivotally mounted in a frame, whereby it can be supported on the floor of the foundry, or

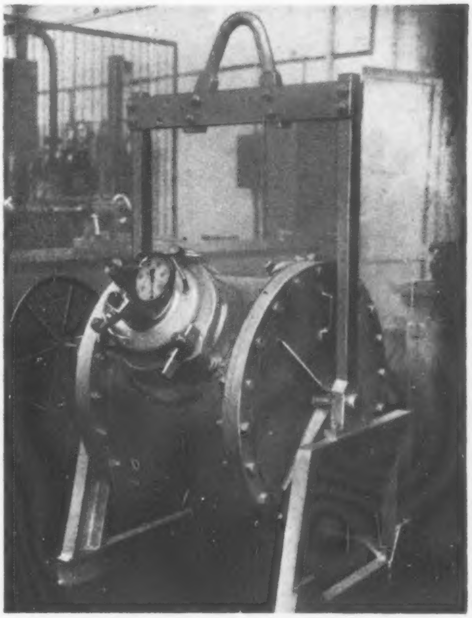


Fig. 2. For the Production of Spheroidal Graphite Iron, the Institute has Developed the Equipment Shown for the Treatment of Molten Iron with Magnesium. The Drum Holds 1½ tons of Iron

suspended from the hook of a crane. The ladle drum has two openings, one for pouring in the molten iron to be treated, and the other communicating with a small auxiliary chamber containing small ingots of pure magnesium. In Fig. 2, the pouring opening is seen at the front, and the auxiliary chamber is just visible at the rear. Both the opening and the chamber can be sealed by covers which are locked in position by wedges.

Sectional views of a 5-ton unit are given in Fig. 3. In the view (x), the ladle drum is seen in the loading position. The chamber for the magnesium is indicated at F, and in this instance, the complete chamber can be removed for loading, and is secured to the main casing by draw-bolts, actuated by lever-operated eccentrics. As may be observed, the chamber is refractory lined, and is closed by a cover of refractory material, wherein there is a small aperture to provide communication with the main drum.

With the auxiliary chamber locked in position, molten iron is poured into the drum through the spout G, until it reaches the level shown. The cover H is then assembled, and locked in position

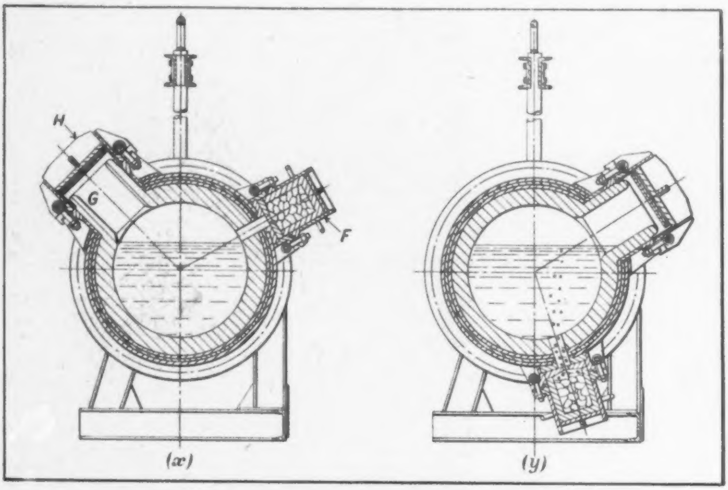


Fig. 3. Sectional Views of a Special 5-ton Capacity Drum-type Ladle for the Production of Spheroidal Graphite Iron. The Drum is Seen in the Charging Position at the Left, and When it is Turned, as Indicated at the Right, the Molten Iron Enters an Auxiliary Chamber Containing Magnesium, which Vaporizes and Passes through the Remainder of the Iron in the Drum

by means of another set of eccentric-actuated draw-bolts. Next, the drum of the unit is swung through 90 deg., until it assumes the position seen in view (*y*). With the drum in this position, the molten iron passes into the auxiliary chamber and causes the magnesium to vaporize. The magnesium cannot ignite due to the absence of air, and the magnesium vapour passes through the iron, and reacts with the molten metal to produce the required spheroidal form of graphite. Vaporization of the magnesium causes the pressure within the ladle-drum to rise slowly, and the stabilization of the pressure serves to indicate that the reaction is complete. This condition is usually reached about 2 min. after inversion, and then the drum is returned to its original setting, the pressure is released by opening a valve, and the cover is removed, in readiness for pouring.

At one side of the main bay of the foundry department has been installed an experimental hot-blast cupola, which has been designed and built by the institute. The cupola is designed to

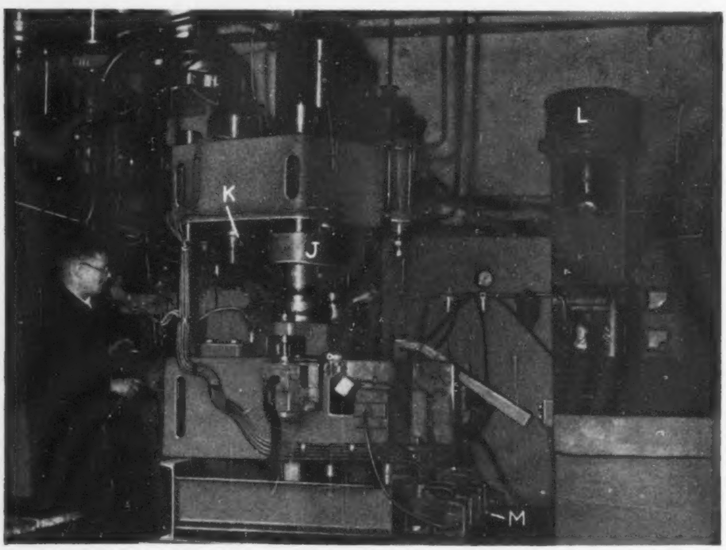


Fig. 4. A Special Extrusion Press and Hopper-fed Induction Heating Unit which has been Developed for the Production of Semi-finished Compressor and Steam Turbine Blades. Heated Billets are Fed into the Press, Flattened, Extruded, and Discharged on an Automatic Cycle

provide metal at a temperature of 1,500 deg. C., at the pouring spout, and is supplied with air that has been heated to 600 deg. C. by a recuperator system. Exhaust gases from the cupola are passed through a cyclone, which extracts dust, and are then delivered to a combustion chamber in the recuperator system, where they are mixed with air and burnt. Incoming air for the cupola is heated in two stages by the recuperator, and the hot gases from the combustion chamber are drawn first through alloy steel tubes whereby the air is heated by radiation, and then pass through cast iron tubes which heat the incoming air by convection, before it is delivered to the radiant heating stage. The gases are drawn through the system by a motor-driven blower unit, and are discharged to exhaust.

Of the closed-top type, the cupola is arranged for mechanized charging, under remote control. At the upper end of the cupola chamber there is a tilt-pan loader, to which metal to be melted is delivered by a skip hoist. The height of the molten metal in the cupola is monitored by means of a radio-active cobalt source at one side of the cupola chamber. Radiation from this source is picked up by a sensing unit on the opposite side of the chamber, and when the metal level falls below that of the source, a signal is transmitted to the control panel in the operator's cubicle at one side of the furnace. The operator then engages the pan tilting mechanism, to deliver a fresh load of metal to the furnace chamber, and when the pan has resumed its original setting, replenishes it with the aid of the skip hoist.

There is a large creep testing laboratory adjoining the foundry department, and a neighbouring building houses the department concerned with the investigation of forging and allied processes. In this department is installed a special automatic extrusion press for the production of blades for steam turbines and compressors, which has been developed by the institute.

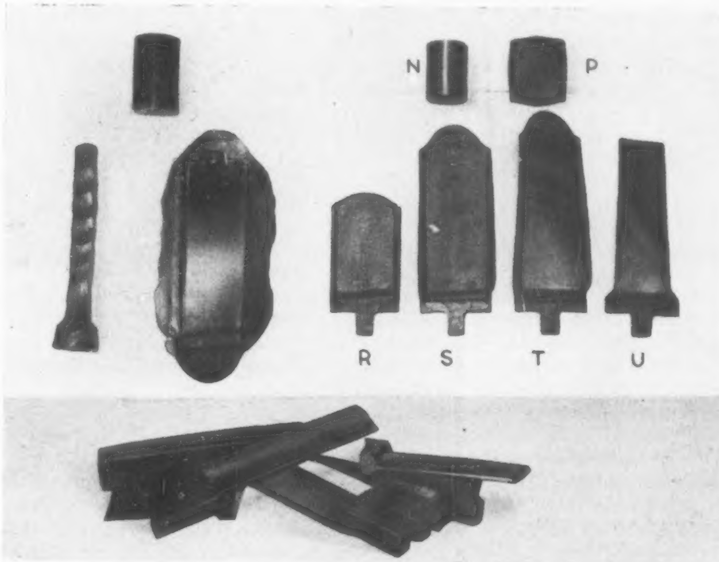


Fig. 5. Stages in the Production of Turbine Blades by the Extrusion and Cold-working Technique are Seen at the Right, and the Former Method of Making Blades by Forging is Indicated at the Left. A Group of Blades made by the New Method may be seen in the Foreground

SPECIAL EXTRUSION PRESS FOR TURBINE AND COMPRESSOR BLADES

A general view of the extrusion press and its associated equipment is given in Fig. 4. The main ram of the press is seen at *J* and there is an auxiliary ram *K*, both rams being hydraulically powered. At the rear, there is a high-frequency induction furnace, to which cylindrical steel slugs are fed from the hopper *L*. Slugs pass through the high-frequency unit where they are heated to the extrusion temperature, and are ejected from the furnace at predetermined intervals. On leaving the furnace, each slug is transferred to a die beneath the auxiliary ram *K*, and is flattened between this die and the punch fitted to the ram, as the latter descends. When the ram rises, the flattened slug is thrust sideways by a hydraulically-operated pusher, and enters the die cavity beneath the main ram of the press. A pressure of 200 tons is

exerted by this ram and most of the metal of the slug is extruded downwards through the die opening to form the blade portion of the workpiece. Some of the metal remains in the die cavity to form the blade platform, and the shape of the extrusion punch is such that a projection is produced on the platform to facilitate handling during subsequent operations. After the press ram has been withdrawn, the extrusion die is moved sideways to a position in line with a third ram, whereby the workpiece is ejected. All motions of the press and its auxiliary units are controlled by solenoid-operated valves and limit switches, and a bank of valves may be seen at *M*. The various motions may also be engaged by means of push-buttons on the control desk, at the right.

Stages in the production of a turbine blade by the extrusion technique are illustrated by the group of workpieces at the upper right in Fig. 5. In this illustration may also be seen the stages in the production of a blade blank by the forging method normally employed, and, in the foreground, a group of blades made by the new method. A slug ready for delivery to the induction heating unit is indicated at *N*, a flattened blank at *P*, and an extruded blade at *R*. After the extrusion stage, the partially finished blades are subjected to two rolling operations, and workpieces after the completion of these stages are seen at *S* and *T*. During the second rolling pass, it may be noted, a twist is imparted to the aerofoil portion of the blade. Finally, the blade is coined and trimmed at a press set-up, to obtain the finished form indicated at *U*.

It is claimed that blades can be produced within a tolerance of 0·1 mm. (0·004 in.) by the new method, whereas the tolerance that could be maintained by the previous forging method was 1·5 mm. (0·059 in.). Moreover, it is stated that, in comparison with the former method, the new procedure has permitted savings of 40 per cent in material, 35 per cent in time and 32 per cent in the cost of the blades, and that a saving of 16 million roubles has been achieved on one blade production line in a year.

The two rolling stages are carried out in succession in a special mill which has been designed and built in the institute. This equipment is installed in the forging department, adjacent to the extrusion press, and its principle of operation is illustrated diagrammatically in Fig. 6. There are there two pairs of segmental rolls, mounted one above the other, as indicated at *V* and *W*. A spindle *X*, carrying a pair of gripper jaws, can be advanced through the space between the lower rolls, when they have been turned through 180 deg. from the position shown, until the jaws are located between the upper rolls, which have also been turned through 180 deg. An extruded blade is loaded between the upper rolls, and the projection that extends from the platform of the blade is held between the jaws. The drive of the mill is then engaged, and, simultaneously, the spindle is lowered and the upper rolls are rotated. By adjustment of the relative speeds of the spindle (downwards) and the rolls, also the setting of the roll spindles horizontally, the metal of the aerofoil portion of the blade is cold-worked to produce the shape seen at S in Fig. 5. During the course of the downward movement, the blade passes clear of the upper pair of rolls and is lowered to a position between the lower pair. Then, the drive to these rolls is engaged, and at the same time a rotary motion is imparted to the spindle *X*. The relative speeds of the rolls, work and spindle are arranged so that the length of the blade is further extended and its thickness reduced, and, at the same time, the aerofoil portion is twisted through the required angle.

It will be observed from Fig. 5, that two ribs,

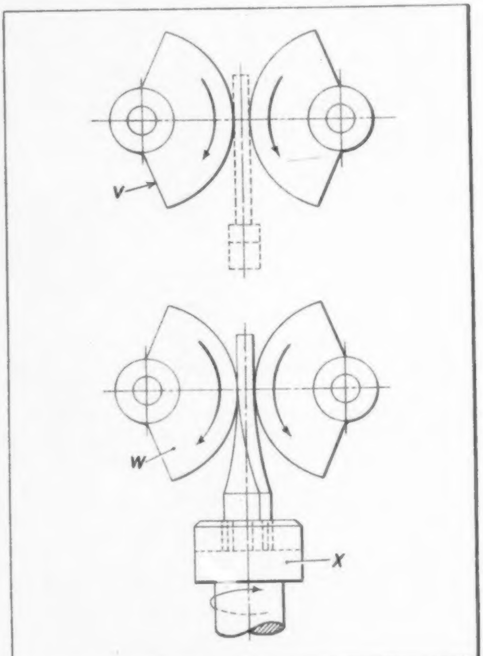


Fig. 6. The Principle of Operation of a Two-stage Cold-rolling Mill for Finishing Extruded Turbine Blades is Here Shown Diagrammatically. During the Second Rolling Operation, the Aerofoil Portion of the Blade is Twisted

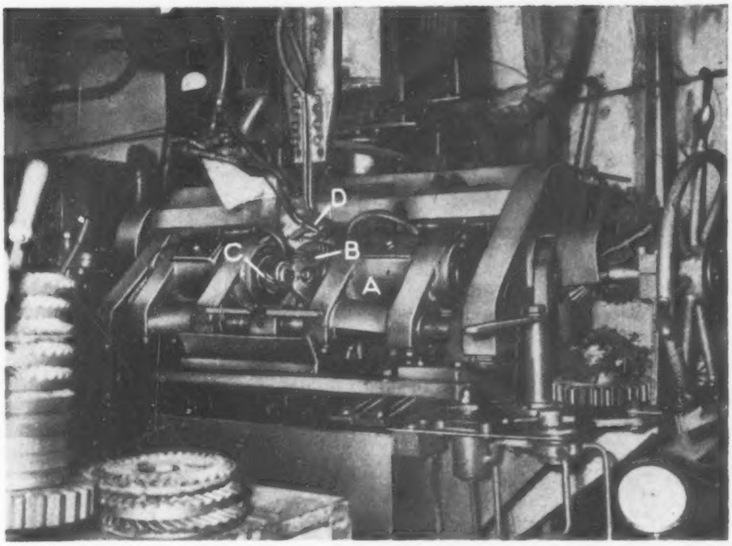


Fig. 7. An Experimental Hot-rolling Set-up for the Production of Spiral Bevel Gears in the Forging Department of the TsNIITMASh Research Institute. Many similar Hot-rolling Units for Spur Gears are Reported to be in Use in Soviet Plants

of circular section, are produced on either side of the aerofoil portion of the blade at the extrusion stage. These ribs serve to protect the thin leading- and trailing-edges, and are removed when the blade is finally press coined and trimmed.

GEAR ROLLING EQUIPMENT

Among other equipment in the forging department, at the time that this article was prepared, were a test-rig for investigations concerned with the eccentric loading of large forging presses, a special machine for the production of finned tubing, and an experimental mill for the rolling of spiral bevel gears. This rolling mill is shown in Fig. 7, and some gears that have been produced with this equipment may be seen in the foreground. The mill incorporates two heads, as indicated at *A*, which are mounted in front of the main housing at the rear of the base. Bearings in this housing carry a horizontal spindle to which the blank to be rolled is secured, as may be seen at *B*. The form of the blank is similar to that which would be employed for a cut gear, except that height of the flange whereon the teeth are to be rolled is suitably reduced.

Each of the heads *A* can be adjusted crosswise on the machine base, and the spindle of each head is driven through gears and telescopic shafts, from the work-carrying spindle. A hardened, alloy-steel, spiral bevel pinion is mounted on each head spindle, and the pinion on the left-hand head is indicated at *C*. At the rear of the rolling mill, there is a large generating unit for high-frequency current, which supplies water-cooled inductor-coils, as at *D*, for heating the blank to the rolling temperature. With the blank heated and revolving at a slow speed, and the two roll-pinions driven at the required higher speed, the work-head is advanced at a slow traverse rate, so that the desired tooth form is produced on the front conical face of the blank. During the rolling operation, a small amount of metal is displaced outwards and inwards, at each end of the teeth, and this excess material must be removed subsequently by a turning operation. It was pointed out by the director of TsNIITMASh that, although the equipment shown in Fig. 7 is only for experimental work, many similar rolling mills for the production of spur gears are now in use in Soviet plants.

CORROSION AND ELECTRICAL HEATING LABORATORIES

There is an extensive and well-equipped laboratory at the institute for the investigation of the effects of corrosive materials on metals, with particular reference to the effects of hot corrosive gases. This department has its own gas supply and mixing plant, and different gases and gaseous mixtures are delivered by overhead pipes to the various laboratory units. The laboratory has separate static and dynamic sections, and in the dynamic section there is a large battery of creep-testing machines, whereby the workpiece can be heated to 900 deg. C. in a gas atmosphere. In this connection it was pointed out that, in corrosive

atmospheres, austenitic steels have poor creep resistance at temperatures below 700 deg. C. Other equipment provides for the investigation of the effects of vibration on specimens in corrosive atmospheres, and there are two test-rigs for research into the behaviour of tubes containing corrosive gases under pressure, when subjected to high temperatures. All the units in the corrosion laboratory are provided with automatic control and recording arrangements. Much of the work that is carried out in this laboratory is associated with gas turbine research and development, and the institute has its own gas turbine plant for testing specimens and experimental components under actual working conditions.

The institute undertakes a considerable amount of research in connection with the application of high- and low-frequency electrical heating, and has laboratories for investigations concerned with both systems. The high-frequency laboratory is engaged mainly on conventional work, and has two large generators, one for supplying power at 20,000 cycles per sec., and the other, at 60,000 cycles per sec. In the low-frequency laboratory, there is a voltage stabilizer of 560 kW. capacity, which will maintain a supply voltage constant within 0·5 per cent, with a time lag of less than 1 sec. A combined low-frequency, high-frequency rig in installed, the low-frequency supply being drawn from the normal electric mains, and the high-frequency current being supplied by a separate 25-kilocycle generator. This rig is employed for work in connection with billet heating and heat-treatment.

Special procedures have been developed by the institute for the treatment of rolls for cold-rolling mills, and equipment is installed for processing rolls up to 730 mm. (28¾ in.) diameter by 3 metres (9 ft. 10 in.) long. It is stated that several large installations have been built to TsNIITMASh designs for industrial use, the largest equipment having a capacity for rolls up to 1.5 metres (4 ft. 11 in.) diameter. The heat-treatment of rolls by low-frequency induction heating, it is claimed, permits savings in cost, time and the space required, and the procedure is cleaner than normal heat-treatment.

Special low-frequency equipment has been developed for the treatment of welded joints between thick steel plates by local heating. Electrically welded joints in plates of 20 mm. (0·787 in.) thickness have been treated to produce a homogeneous structure, with properties that remain constant across the joint instead of falling off towards the centre.

METAL-CUTTING LABORATORY

Work concerned principally with the development of heavy metal-working machinery and the machining of high-strength and corrosion-resisting alloys is carried out in the metal-cutting laboratory of the institute. Investigations have been undertaken over a number of years in connection with ceramic tools, and a large Krasni Proletarii lathe has been installed for cutting tests. This lathe will swing workpieces of 350 mm. (13·779 in.) diameter over the saddle, and can accommodate lengths up

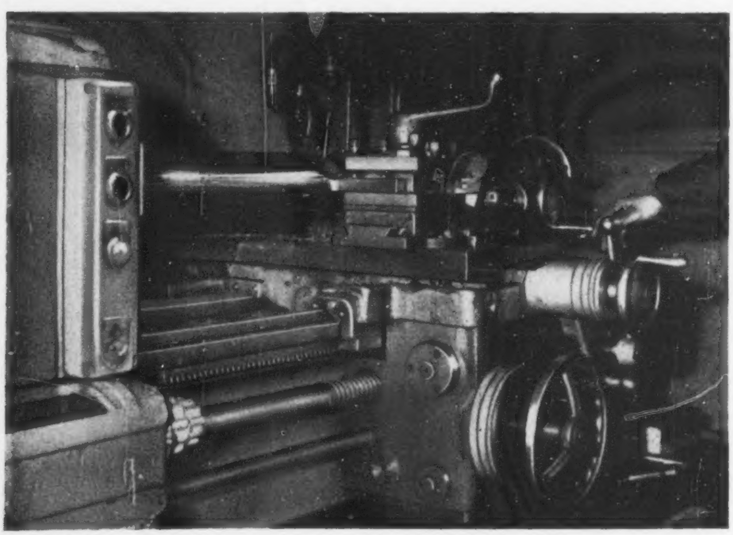


Fig. 8. Turning a Medium Carbon Steel Billet on a 20 h.p. Krasni Proletarii Lathe with a Tool Bit of Soviet Ceramic CM332. The Cutting Speed is 2,296 ft. per min., the Feed Rate, 0·011 in. per rev., and the Depth of Cut, 0·079 in.

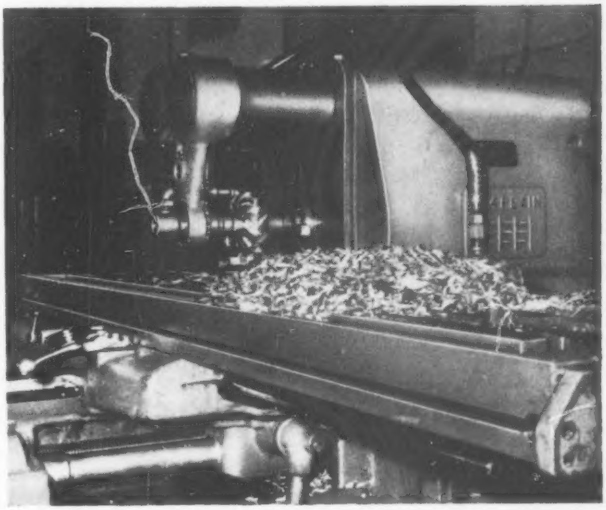


Fig. 9. Milling a Semi-circular Groove in an Alloy Steel Workpiece, Containing 0·2 per cent. of Carbon and 13 per cent. of Chromium, with Special Interlocking Form Cutters of 40-deg. Rake Angle, 10-deg. Clearance Angle and 40-deg. Helix Angle. The Cutting Speed is 197 ft. per min., and the Traverse Rate 10½ in. per min.

to 1·5 metres (59 in.) long between centres. Driven by a 20-h.p. motor, the lathe has spindle speeds ranging up to 3,000 r.p.m. At the time that this article was prepared, the lathe was being used for evaluation tests of carbide and ceramic tool materials, and a billet of medium carbon steel was being turned at a feed-rate of 0·3 mm. (0·011 in.) per rev., and a depth of cut of 2 mm. (0·079 in.). When a tungsten carbide tool tip was used under these conditions, rapid failure occurred at a cutting speed of 400 metres (1,312 ft.) per min., due to heavy cratering wear on the top face, behind the cutting edge. With a tool tip of Soviet ceramic CM 332, the cutting speed could be increased without tool failure, and in the close-up view of the lathe in Fig. 8, the ceramic tool is seen at the start of a traverse at a cutting speed of 700 metres (2,296 ft.) per min. The length of traverse was about 2 ft., and at the end of the cut no deterioration of the tool tip was evident. Both the tungsten carbide and ceramic tips were of the clamped type, and the tool holders were fitted with sheet-steel shrouds to deflect the swarf produced.

MILLING CUTTERS WITH HIGH RAKE, CLEARANCE AND HELIX ANGLES

As a result of investigations into the form-milling of high-strength steels, the institute engineers have developed special milling cutters with high rake, clearance, and helix angles. These cutters are claimed to provide a rate of metal removal per regrind which is five times as great as that obtainable with conventional cutters. Fig. 9 shows a close-up view of a typical cutter of this type at the conclusion of a milling pass whereby a semi-circular groove was produced in a slab of alloy steel containing carbon 0·2, and chromium 13 per cent. For the milling operation, the slab was held by side clamping screws in a simple fixture, which was secured to the table of a Kearney & Trecker Milwaukee No. 4 plain milling machine. A pair of interlocking, staggered-tooth form-milling cutters was used, and each cutter had eight high-speed steel, inserted teeth. Each tooth was of a corrected form, and had a helix angle of 40 deg., a rake angle of 40 deg., and a clearance angle of 10 deg. A cutting speed of 60 metres (197 ft.) per min. was employed, and the work was traversed at a feed-rate of 10½ in. per min.

SPECIAL DRILL POINT FOR TITANIUM

Research into the machining of titanium has been carried out by TsNIITMASh, and as a result, a special drill point has been developed, which is claimed to offer a number of advantages for the production of holes in this material. The drill point is shown in Fig. 10, and it will be noted that it is similar to the design point described in MACHINERY, 90/33—4/1/57, in that it incorporates two cone angles, instead of the usual one. Four cutting edges are thus provided, and a notch is ground in each edge, as shown. Each drill flute has a very narrow land, usually of the order of 1 mm. (0·039 in.). It is stated that when a drill of 10 mm. (0·394 in.) diameter, with a nose of this type, is used to produce holes in titanium, it can be run at a cutting speed of 15 metres (49 ft.) per min., and fed at a rate of 0·3 mm. (0·012 in.) per rev.

SIMPLE EXPANDING REAMERS

Among other cutting tools that have been developed by the institute may be noted a range of simple expanding reamers, which have been

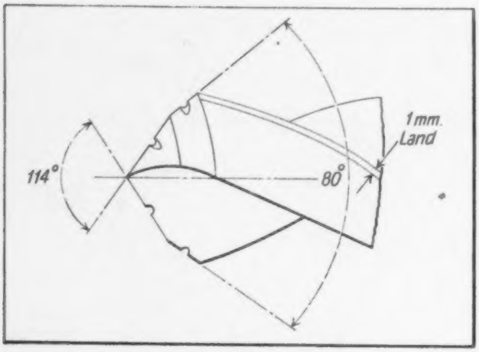


Fig. 10. This Special Form of Drill Point has been Developed by TsNIITMASh for Machining Holes in Titanium

designed to meet the needs of Soviet industry for an inexpensive tool that is capable of finishing holes to close limits. At present, these reamers are made in a range of sizes—for example, 15 mm. (0·591 in.) diameter, with 0·8 mm. (0·032 in.) of adjustment; 45 mm. (1·772 in.) diameter, with 2 mm. (0·079 in.) of adjustment; and 170 mm. (6·693 in.) diameter, with 9 mm. (0·354 in.) of adjustment—and it is stated that they are capable of producing holes within limits of 0·01 mm. (0·0004 in.).

Two of the smaller reamers in the range are shown in Fig. 11, and one of them has been dismantled in order that its construction may be observed. Each reamer incorporates a steel bar *D*, with a Morse taper shank at one end. The other end has two threaded portions, and the end of the larger thread is machined to form four inclined flat faces. There are two cutter blocks, as indicated at *E*, and each block carries two high-speed steel or tungsten carbide inserted blades, as at *F*, set at an included angle of 90 deg. Each block is machined to form two internal flats, which are inclined at the same angle as the flats on the bar *D*, and both ends of each block are machined to a conical form.

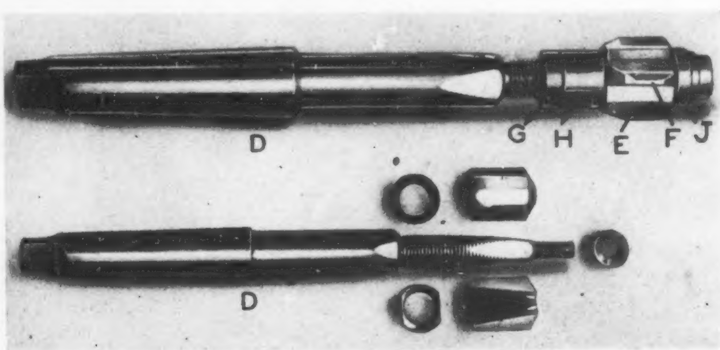
When the tool is assembled, a lock nut *G* and a nut *H* are fitted on the larger threaded portion. One end of the nut *H* is machined to an internal conical form, and a similar form is machined at one end of the nut *J* for the smaller threaded portion of the bar. The internal cone ends of these two nuts engage the external conical surfaces at the ends of the two tool blocks *E*, when the latter are mounted on the tapering flat surfaces of the bar *D*, so that the blocks are clamped firmly on the bar as the nuts are tightened. By slackening off one nut and tightening the other, the blocks can be moved along the taper surfaces of the bar, the cutting edges thus being moved outwards or inwards to produce holes of different diameters.

The larger reamers are of generally-similar construction, as may be seen from the sectional views in Fig. 12. In this instance, however, the shank is made in two parts, *K* and *L*, which are joined by welding. Inserted blades with brazed-in carbide teeth are employed, as indicated in the cross-sectional view on *X-X*, and the nut for the smaller threaded portion has an engraved scale to facilitate setting.

Other equipment that has been developed in the machining laboratory includes a range of manually-operated hydraulic clamps for securing large workpieces to machine tables and bed-plates, the largest of which can exert a force of 10 tons. The design is based on the principle of the differential hydraulic ram, and units have been developed for the application of clamping pressure horizontally and vertically.

To permit of finishing large rolls on old lathes, to high standards of quality, the institute have designed and built two sizes of superfinishing

Fig. 11. Simple Expanding Reamers Developed by the Institute are Here Shown Assembled and Dismantled. Reamers of this Type are Now being Made in a Range of Sizes for Use in Soviet Plants



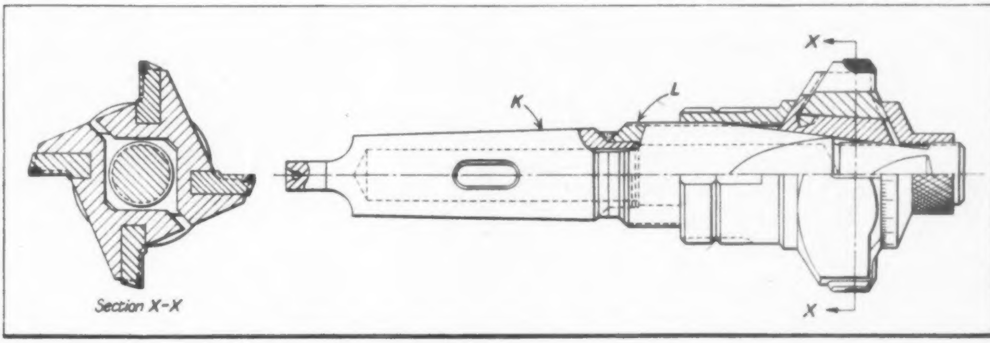


Fig. 12. Sectional Views of One of the Largest Units in the Range of TsNIITMASh Expanding Reamers

heads, incorporating reciprocating pads which are loaded with abrasive. The larger head is suitable for finishing workpieces of 800 mm. (31·496 in.) diameter, and the smaller, workpieces of 300 mm. (11·811 in.) diameter. The cost of abrasive for a finishing operation is very small—of the order of 0·12 roubles—and it is stated that finishes of 0·3 micron (0·000012 in.) can be achieved. Rolls finished with these heads are said to have twice the life of those that have not been so treated, and it is also claimed that when such rolls are used for rolling tin foil, rolling speed can be increased, and a higher quality product obtained.

As a result of investigations into the tapping of large turbine parts, TsNIITMASh has developed a special nose form for second and third taps, of the solid and collapsing types. Generally, the form is produced by grinding away two or three full teeth, to provide independent guiding and cutting teeth, as indicated in Fig. 13. The number of guiding teeth depends on the size of the tap, and for a tool of 3 mm. (0·118 in.) pitch, three cutting teeth are employed, the last of which is of full thread form.

STRENGTH OF MATERIALS LABORATORY

The extensive " strength of materials " laboratory is housed in a modern well-lit building, and one of the bays of this department may be seen in the heading illustration. Large numbers of static testing machines of different sizes are installed, and these machines, it may be noted, are of TsNIITMASh design, and are now being built in quantity for general use in industry, also for export. There is a battery of creep testing machines in a separate section of the laboratory, and equipment is provided for stress investigations by photo-elastometric techniques.

Special attention is paid to the fatigue strength of materials, particularly in connection with large specimens, and new testing techniques and equipment have been developed in the laboratory. Among the new equipment is a number of fatigue testing machines in which the specimen is subjected to reverse bending in a horizontal plane. The layout of the largest, type YP 200, fatigue testing machine is shown in Fig. 14, and this machine can be used for testing specimens of 300 by 200 mm. (11 13/16 by 7 7/8 in.) cross-section, with lengths up to 6 ft. In Fig. 14, the specimen in indicated at *M*, and it is clamped at either end in massive, steel box-members, of built-up construction. One box-member is seen at *N* and the other at *P*. Similar clamping arrangements in each member incorporate two pairs of thrust-bars, as at *R*, which are angularly disposed, and can be drawn together by means of a large bolt. One bar of each pair

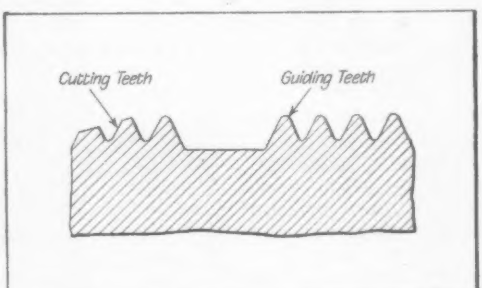


Fig. 13. As a Result of Research into the Machining of Large Turbine Parts, the Institute has Found that the Use of Second and Finishing Taps with Noses of this Form is Advantageous

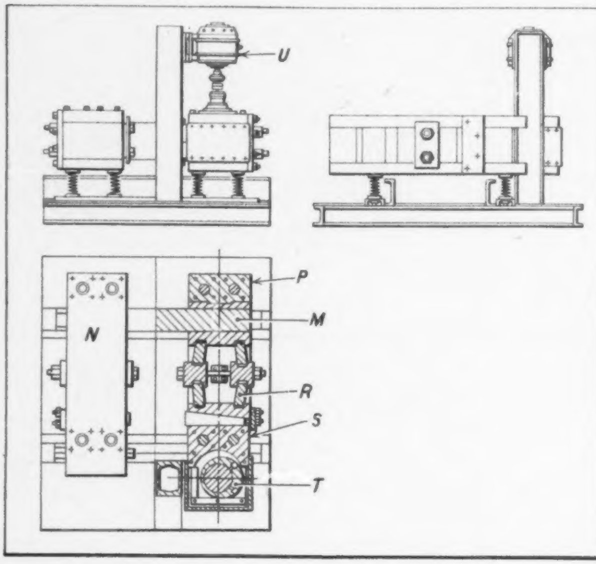


Fig. 14. General Arrangement of the TsNIITMASh Type YP 200 Fatigue Testing Machine, for Specimens with Cross-sections up to 11 11/16 in. by 7⅞ in. The Specimen is Subjected to Continuous Reverse Bending in the Horizontal Plane

thrusts against an abutment S, and between the abutment and the end block of the box member is interposed a screw-operated wedge, which provides for adjustment. The other thrust-bar of each pair applies pressure to a shoe which contacts the specimen.

Both box-members are supported on spring mountings, to prevent the transmission of vibration to the laboratory floor and surrounding equipment, and the box-member *P* can be reciprocated by the action of an eccentric *T*. The eccentric shaft is connected by a flexible coupling to an electric motor *U*, mounted on a vertical column. As the box-member *P* is reciprocated, one end of the specimen *M* is subjected to alternating stresses, and due to the inertia of the box-member *N*, is caused to vibrate in the horizontal plane.

Before a test is carried out, a static load of known magnitude is applied to the specimen, and its deflection is measured. Then, the load is removed, and the specimen is vibrated for a predetermined time. At the end of this period, the vibration is stopped, the original static load is again applied, and the deflection of the specimen measured. The difference in the amounts of deflection serves to indicate the effect of the fatigue induced in the specimen as a result of the vibrations, and the test is repeated, with measurement of the deflection at intervals, until the specimen breaks. Type YP 200 fatigue testing machines have been used for investigation of welded joints, particularly in connection with a new method of slag welding, whereby joints which are stronger than the parent metal are produced in very thick sections.

The institute has also developed a large vertical testing machine for the investigation of the fatigue

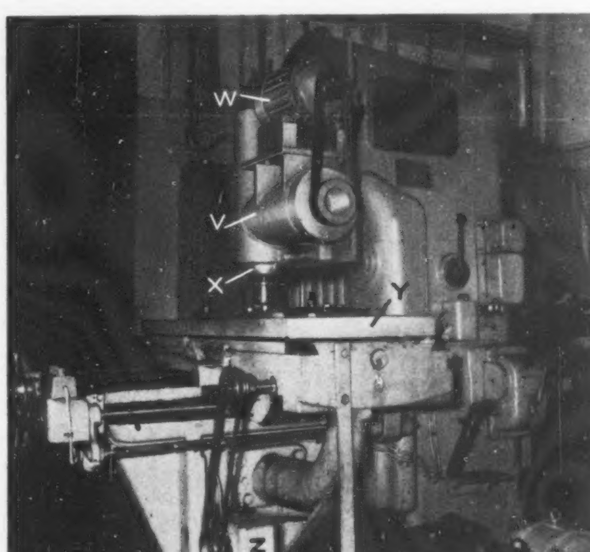


Fig. 15. This Experimental Machine is Employed in the Institute for the Peening of the Surfaces of Metal Specimens to Increase Fatigue Resistance

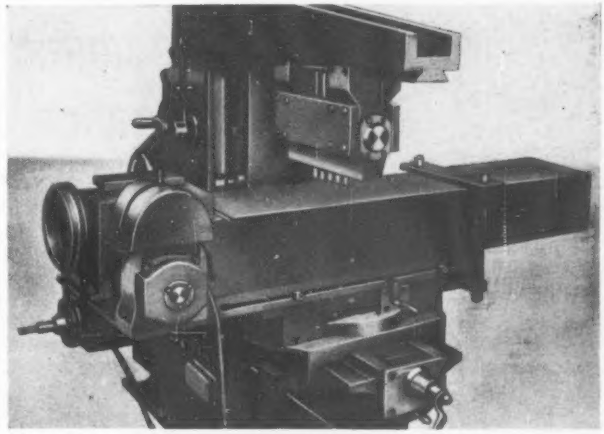


Fig. 16. Based on the Experimental Machine, the Institute has Built this Unit for the Treatment of Large Specimens by Peening, Using Five Punches Simultaneously. Equipment for Peening Cylindrical Parts on a Lathe has also been Constructed

life of cylindrical specimens, such as shafts, up to a maximum diameter of 200 mm. (7⅞ in.). Several of these machines, designated type Y 200, are installed in the laboratory, and it has been found that when smoothly-finished specimens are tested, and this applies also to the YP 200 units, failure usually occurs near the supports. If the surfaces of the specimens have been treated by shot peening, however, fatigue resistance is improved, and failure occurs at the middle of the specimen.

SURFACE PEENING MACHINES

Since the production of surface depressions of the necessary depth by shot-peening presents difficulties, the institute has developed equipment for the treatment of surfaces by hammering. An experimental machine, shown in Fig. 15, is installed in the strength of materials laboratory (on the right-hand side of the gangway at the far end in the heading illustration). The peening unit is secured to the top of the column of this machine, at the front. In this unit, a flat plate supports a housing *V* for a horizontal shaft, which is mounted in roller bearings and is driven by the motor *W*, through V-belts. The shaft carries an eccentric which imparts a vertical reciprocating motion to the ram *X*, and to the lower end of the ram can be secured punches of various types for carrying out the peening operation.

A knee unit is adjustable on guideways at the front of the machine column, and carries a saddle which can be moved in the horizontal plane beneath the ram *X*, by means of a handwheel-operated screw. The saddle is supported by heavy brackets at either side of the knee, and has dovetail guideways whereon slides a table *Y*. This table can be traversed on the saddle guideways by means of a screw which is driven by V-belt from a motor and reduction gearbox *Z*. The arrangement is such that when a workpiece has been clamped to the table surface, it can be traversed to and fro beneath the reciprocating peening punch, and at the end of each traverse movement, the table can be moved crosswise by means of the saddle feed screw, so that rows of depressions are formed on the work-surface. Both the peening-unit motor and the table-traverse motor are controlled by individual "start" buttons and a common "stop" button, at the front of the knee.

Based on this design of experimental machine, TsNIITMASh units have been built for treating workpieces of rectangular and circular cross-section. The machine for rectangular section workpieces is seen in Fig. 16, and is similar to the unit already described, except that it incorporates a battery of five peening punches in order that the time required for the treatment of large specimens may be reduced. In Fig. 16, it is seen set up for peening a specimen for one of the large TsNIITMASh horizontal fatigue testing machines. The equipment for peening cylindrical parts has been designed for mounting on the saddle of a large lathe. It may be of interest to note that the axles of all Soviet trolley buses are treated by the peening technique.

The next article in this series devoted to Soviet engineering industry will be concerned with the work of ENIMS—the Central Experimental Scientific Research Institute for Machine-Tool Construction, Moscow—and will be published shortly in MACHINERY.

WOOD-WORKING MACHINE TOOLS built in this country during the first quarter of this year had a total value of £1,131,000, and machines to the value of £376,000 were exported. The corresponding figures for the first quarter of last year were £1,072,000 and £369,000.

H

Kanthal-Oakley Automatic Coiling Machine for Resistance Spirals

Hall & Pickles, Ltd., Port Street, Manchester, are the sole distributors in Great Britain for the Kanthal-Oakley coiling machine, here shown, which, by arrangement with the American patentees, is being made in Sweden by Aktiebolaget Kanthal.

This machine, which incorporates the results of many years of development work, is said to produce resistance wire spirals of exceptional accuracy. It is claimed, moreover, that the spirals, so formed, may subsequently be stretched, cold, to form heating elements, without causing irregular variations in pitch or diameter.

Of compact design, the machine is normally supplied for bench mounting. The base measurements are 27½ in. by 21 in., and height is 27½ in. Resistance wire from 1·00 mm. to 0·12 mm. diameter can be formed on this machine into close wound, space wound, double wound, or mixed-pitch spiral elements.

The machine is shown equipped for the production of close-wound and double helix elements. For the normal single spiral, only one wire spool, indicated at *A*, is employed. Wire is fed from the spool through a series of straightening rollers, round a tensioning pulley, to which a braking force is applied by a weighted arm, and then over a metering wheel *B*, whence it passes to a further roller, and finally to a tungsten-carbide mandrel, whereon the spiral is formed by two opposed disc-shaped winding rolls, one of the latter being visible at *C*. The mandrel, which rotates at 4,200 r.p.m., and both winding rolls, are driven by a small electric motor. Adjustable clutches, between the motor gearing and the driving shafts of the winding rolls, enable the peripheral speed of the latter to be matched to that of the wire spiral which is being formed on the mandrel. A spring tensioner serves to hold the rolls against the wire and the mandrel with equal forces. Spirals of different diameter can be wound by changing the mandrel and rolls.

When wire of small diameter—say 0·5 mm. or less—is being close wound, only the front winding roll need be used, but for space wound spiral elements both front and rear rolls are required, the latter being provided with a flange which determines the pitch of the spiral. For spirals with two different pitches, a front roll with a wedge-shaped flange is used to impart the basic pitch, after the material has been close wound initially. A wedge, mounted on the shaft of the rear winding roll, is then inserted into the turns of the spiral, by means of a solenoid, and the pitch is thereby increased locally in proportion to the forward setting of the wedge. A cam operates the contacts which energize the solenoid and thus controls the length of spiral over which the pitch is increased. By using a second wire spool and braking system, as shown in the illustration at *D*, double helix or tandem spirals may be produced. For this purpose, the wire brakes must be set to provide equal tensioning.

A cut-off blade severs the spiral when it reaches the required length, as determined by a cam driven by gearing connected to the metering wheel. A large solenoid operates the blade, the energizing current being applied through a switch which is controlled by the cam.

A machine installed in the works of Hall & Pickles, Ltd., can be demonstrated by arrangement.

Kanthal-Oakley Automatic Coiling Machine for Resistance Spirals

Smooth Finishes Obtained by Roller Burnishing

By C. R. MORRIS

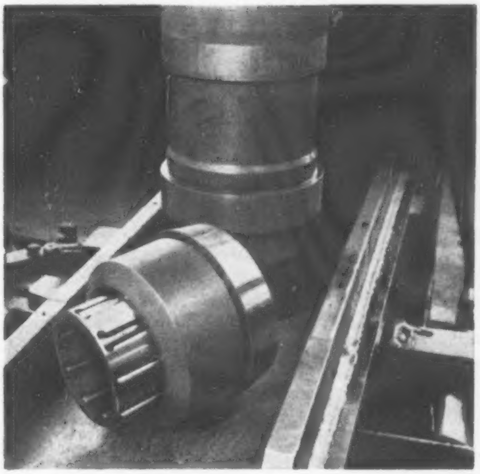


Fig. 1. This Tool for Burnishing External Surfaces has Nine Hardened Steel Rollers Equally Spaced Around a Holder by a Retaining Cage

Multiple-roller burnishing tools are being employed to obtain high quality, smooth surfaces rapidly and economically at the Highland Park plant of Chrysler Corporation, Detroit, Mich., U.S.A. No special machine tools are needed, and both internal and external cylindrical surfaces on various torque-converter parts are being finished on standard vertical drills.

A tool for burnishing external surfaces—as supplied by the Madison-Faessler Tool Co., Moberly, Mo.—comprises a number of tapered, hardened steel rollers, equally spaced around the tapered bore of a holder by a retaining cage, as seen in Fig. 1. A micrometer adjusting nut is provided to vary the axial position of the rollers in relation to the holder bore, for setting to suit the diameter of the surface to be burnished. Such an external tool is self-feeding because the rollers are set at a slight angle to the axis of the mandrel.

For burnishing internal surfaces, a spring-expanded tool with three carbide rollers, designed by Chrysler, is employed. Such a tool is shown in Fig. 2. Normally, an internal surface is burnished as the tool is fed into the work. This tool, however, can be fed in either direction and burnishing is, in fact, carried out during the upward stroke, to provide for blending the finishing bore with the chamfer at the outer end.

Rolling pressure is automatically released when the tool contacts a pre-set stop on the machine, or by means of a stop-collar on the tool itself. With an external tool, the rollers feed forward independently until they pass beyond the end of the holder and then expand. In an internal tool, the rollers are mounted on spring-loaded arms, and are set to the desired size and pressure by means of adjusting screws.

A torque-converter assembly, on which the bore and periphery of the hub have been roller burnished, is shown in Fig. 3. External burnishing of the hub periphery is performed on

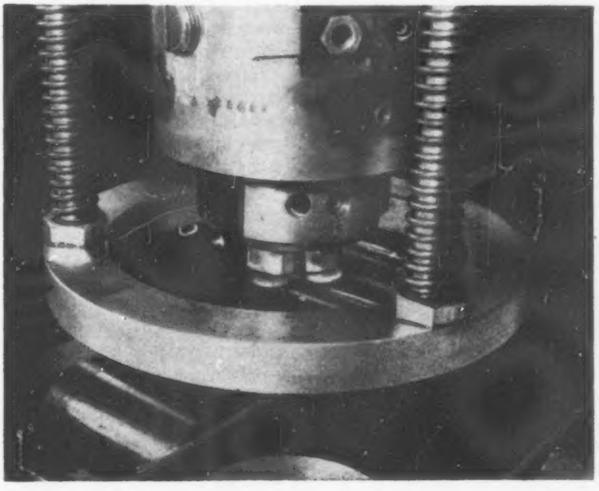


Fig. 2. An Internal Burnishing Tool with Three Carbide Rollers is Employed to Finish the Bores of Hubs on Torque Converter Assemblies

an Edlund No. 2 drill. An air-operated, pilot-type fixture raises the workpiece against stops, location being taken from the crankshaft counterbore in the assembly. The tool rotates at 225 r.p.m. and is fed at the rate of 0·060 in. per rev. Loading, burnishing and unloading require only 16 sec.

Whereas a maximum surface roughness of 10 micro-inches is specified for the hub periphery, a finish of 5 micro-inches is consistently obtained. This external surface is burnished to a diameter of 2·125 in. for a minimum length of 0·63 in. Ordinarily, where an optimum surface finish is to be produced, burnishing is not employed as a sizing operation. If a uniform surface finish is not required on all parts, however, the tool can be used effectively to control the diameter. This control is possible because the tool size can be adjusted precisely with the micrometer nut, which is calibrated in increments of 0·0001 in.

In practice, the surface finish produced on the workpiece depends on the physical properties of the metal, the nature of the surface obtained at the preceding operation, and the amount of material to be displaced. As the ridges on the surface are flattened and the depression filled, metal is displaced at right angles to the axis of the rolls. Cold-working of the metal increases the hardness and produces a wear-resistant surface. Cross-hatch patterns obtained with previous finishing methods are avoided, and final assembly is facilitated.

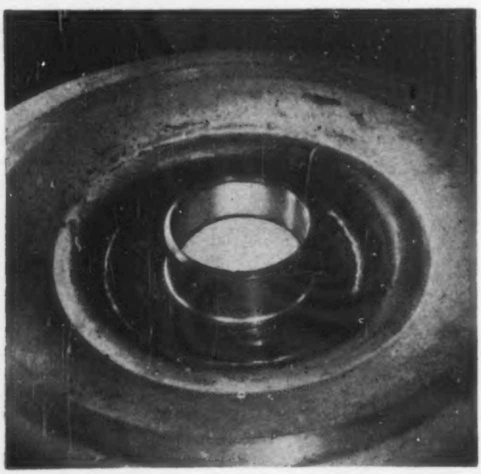


Fig. 3. Both the Hub Bore and Periphery on this Torque-converter Assembly are Roller Burnished with the Tools Shown in Figs. 1 and 2, Mounted on Standard Vertical Drilling Machines

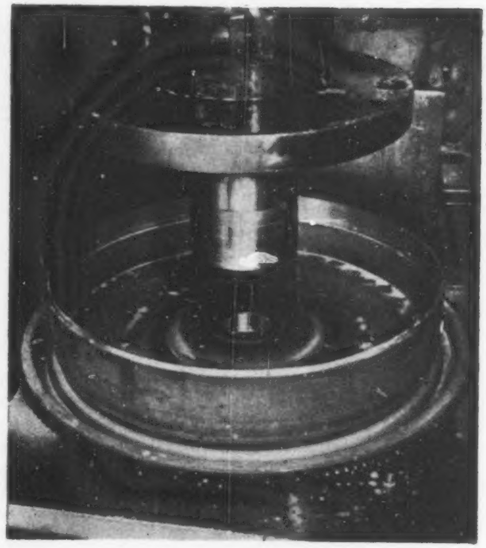


Fig. 4. Set-up for Roller Burnishing a Thrust Face on the Front Cover Assembly of a Torque Converter. The Tool is Provided with Six Radial Rollers

The bore of the impeller hub on the torque-converter assembly is roller-burnished to a diameter of 1·8755 in. for a minimum depth of 0·60 in. A finish of 50 micro-inches is permitted on this surface, but the roughness is reduced to 10 micro-inches or less. This operation is performed on a Buffalo No. 2 drill with the burnishing tool rotating at 940 r.p.m. and feed at the rate of 0·004 in. per rev. is applied by means of a cam. An air-operated, pilot-type fixture, similar to that employed for external burnishing, serves to locate and clamp the work. In addition, a spring-loaded ring (Fig. 2), surrounding the tool, holds the part down and prevents it from rotating. The floor-to-floor time for this operation is only 16 sec.

Another roller burnishing operation at the Chysler works is illustrated in Fig. 4. With this set-up, the thrust face of a sheet metal stamping on the torque-converter front cover assembly is burnished. The operation is performed on a Barnesdril vertical drilling machine equipped with a Bellows feed unit and a Cogsdrill burnishing tool which has 6 radially-positioned rollers each ½ in. diameter by ¾ in. long. A maximum surface roughness of 20 micro-inches is specified for the 2⅝-in. diameter thrust face on this torque-converter stamping.

The Contribution of Brazing in Light Engineering*

Design and Process Selection

By E. V. BEATSON,† B.Sc.(Eng.), M.I.E.E.

The various thermal joining processes, comprising brazing and resistance and fusion welding, now have an established place in the light engineering industries. It is generally accepted, moreover, that the final detailed design of any product must incorporate the requirements of the selected joining process if full advantage is to be taken of that process.

Today, two factors make it necessary to review all the joining processes in relation to each new application, to ensure that the best one is selected.

Firstly, the years immediately following the 1939-45 war have seen very important advances in all forms of welding and brazing, as in allied fabrication methods. The rate of progress appears to be increasing rather than decreasing, possibly under the impetus of the new industries and the increasing demands made by them on existing and new engineering metals. Frequently, there are several ways of fabricating and joining a component, where a few years ago there might only have been one. Often, too, a method rejected as inferior two years ago may already have been developed sufficiently to be the most satisfactory.

Present competitive conditions and the emphasis on maximum efficiency and productivity demand that detailed knowledge of all processes should be brought to bear on each problem, however straightforward it may appear at first.

It is proposed to consider here the brazing processes, primarily, but always in relation to alternative methods and to the question of process selection.

Brazing can be applied in one form or another to most metals and to many combinations of different metals.

The preference under present day conditions is naturally for those methods which allow the best use of unskilled labour. This consideration applies particularly to medium and large quantity production in established industries. For a different reason, it applies also in the newer industries, where fully controlled processes can ensure the very high quality and consistency demanded.

* Abstract of a paper presented at the Conference on Technology of Engineering Manufacture organized by the Institution of Mechanical Engineers.

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PROCESS SELECTION

The first essential is that the final selection of the process to be used should be made during the design stage. All component details can then be arranged to ensure the ultimate attainment of a satisfactory product at minimum cost, and smooth, trouble-free manufacture.

Design and process selection must thus proceed hand in hand on the basis of: (1) The functional requirements of the product. These requirements include joint properties such as strength and ductility, operating temperature, possible subsequent processing such as heat-treatment, and decorative or protective finishes. (2) The type of production envisaged, the probable quantities and, particularly where a limited quantity is involved, the possible use of existing production equipment. (3) General economics. It is insufficient to compare only the actual joining operations. Costing must include the initial cost of producing individual parts ready for joining and any subsequent machining, cleaning, or finishing.

A simple example will illustrate some of these points. A shouldered mild-steel pivot pin of ¼ in. diameter was to be joined to part of a switch mechanism, made from 16-gauge mild steel. Brazing was an obvious possibility, and, with an initial demand of 10,000 per week, copper brazing in a reducing atmosphere conveyor furnace was indicated, even though furnace capacity was not available. The joint would be subjected to vibrational stress and occasional "snatch-impact," but would not be highly stressed, and it was considered that copper brazing would be completely satisfactory from this aspect.

Resistance projection welding, if it would provide sufficient strength, was favoured from the standpoints of flow production and economy. The saving would be only slight because of the extra cost of machining the pin for welding, which would not permit the use of the same free-cutting steel as could be employed if the components were joined by brazing.

Stress calculations indicated a danger of failure under vibrational fatigue conditions, and tests were therefore made which confirmed these fears. The difficulty might have been overcome by in-

creasing the thickness of the plate and the size of the weld, but brazing would then have been more economic than welding.

COMBINATIONS OF SEVERAL PROCESSES

Frequently, the soundest design will be achieved by a combination of techniques. Fig. 1 shows a section through one of the cases for a new range of solenoids. These cases are of low-carbon mild steel, and, for speed and simplicity, the first experimental solenoids were made by machining the end fixing plates from the solid and copper-brazing them to the cylindrical bodies, which were turned from heavy tubing.

As the quantity required was 30,000 per week, comprising four types, this design could be considerably improved. For each type, a spigot was needed to locate the body during brazing, but there were differences in the shapes of the fixing plates and the design of the tapped bushes or studs fastened to them.

Fabrication could be carried a stage further by

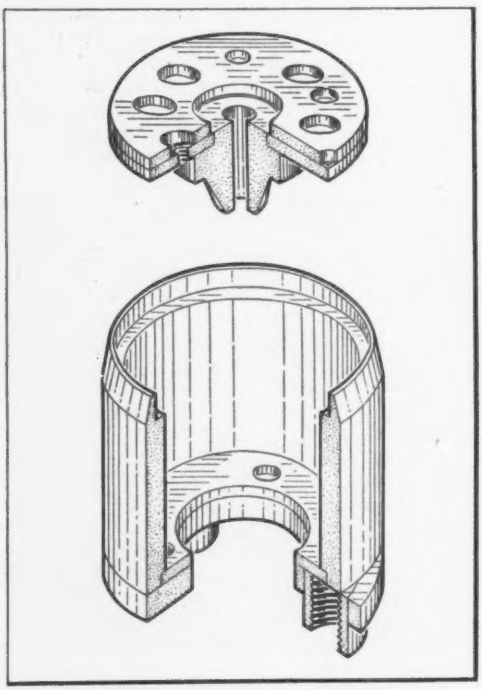


Fig. 1. Mild-steel Solenoid Case and End Plate Produced by a Combination of Projection Welding and Copper Brazing

blanking the circular spigot and projection-welding it to the main fixing plate. The bushes have a fine knurl on the outside surface so that the corresponding holes in the plates can be left "as pierced," and will still provide adequate interference for accurate location, with ample capillary paths for the brazing copper to penetrate.

After the welding operation, the bushes are inserted and the body is brazed to the end plate in a reducing atmosphere conveyor furnace, a ring of copper being placed inside the body on top of the spigot. The copper from this single ring feeds the main joint between body and plate, and the two bush-to-plate joints. It also brazes the two plates together, so that the welding may be regarded merely as a method of location for brazing.

On end plates of other types, which have long small-diameter fixing studs instead of bushes, the studs are projection-welded prior to brazing. This method obviates the need for drilling holes at different centre distances in what is otherwise a standard end plate.

The end plate and core of the unit illustrated is fabricated in the same manner. In this instance, there is no specially-shaped end plate with circular spigot to make the separate blanking and welding technique so attractive. However, the method still permits an economy, as it enables different-size holes to be pierced in the two plates, and a small slot to be sheared into the periphery of one of them to provide the equivalent of two counter-bored holes and a location slot without expensive machining.

All the assembly operations involved in producing these components can be carried out on automatic equipment, and where operators are required they may be unskilled. The components are clean and bright, ready for final assembly or normal protective plating, without requiring finishing or cleaning.

A point about copper brazing, which is often not appreciated, may perhaps be stressed. The process is normally carried out in continuous conveyor furnaces loaded by unskilled operators, and is, of course, eminently suitable for large-quantity production of the type discussed above. However, the furnaces are not special-purpose machines in the same sense as, say, an automatic indexing projection welder, on which all dies, fixtures, electrodes, and extractor gear must be changed, together with all welding settings, if a different component is to be welded, always assuming the machine is capable of welding them both. A brazing furnace will operate with virtually full efficiency and economy, regardless of whether it is handling large quantities of one assembly or

smaller batches of a variey of work. Provided that the work is very roughly of the same order of size and weight, no adjustment will be needed except for an occasional change in the loading pattern or an even more occasional change in conveyor speed.

Furnace brazing may therefore be particularly attractive economically to smaller firms where it is required to join a variety of suitable components, each in medium or small quantities, since such firms might not be able to take as full advantage of the latest high-speed automatic special-purpose resistance welding machines as a company engaged in really large quantity production. In both cases, greater flexibility is obviously offered to designers and production engineers in connection with sudden unforeseen changes in design or output, or the introduction of new or modified designs.

DESIGN AND DEVELOPMENT

The efficient design shown in Fig. 1 could not have been achieved if the designer had not been fully conversant with the processes concerned, or, as in this instance, had not had available, for repeated consultation, a specialist with this knowledge. Such consultation has an even more important advantage. A problem, for which only a partial or "second best" solution can be found, may now be expected to initiate development work which may be applied later to the design or to similar new components.

A good example is afforded by the gear wheel and crankpin shown in Fig. 2. The steel disc carries a nylon gear which transmits the main drive from a small motor. The disc is mounted on a central spindle seen projecting to the left, and carries a crankpin. In an earlier design, which was in production 10 years ago, both the spindle and pin were copper brazed in holes drilled in the disc, as this was the only economic method of achieving the strength and very close dimensional tolerances required.

Since there were several different positions of the pin relative to the spindle, to provide for various crank lengths, different drilled plates had to be carried in stock, and obvious economies would have resulted if the pin could have been resistance-welded to a common disc in any position, as desired. At the time, projection welding did not give sufficiently consistent results to meet the demands of the relatively heavy alternating and fluctuating loads. When machine improvements and developments in projection shape and welding techniques had advanced sufficiently, a programme of static and fatigue strength tests of projection-welded and copper-brazed joints confirmed that for this application such welding was now satisfactory, if strict quality standards were maintained. The later components were designed for projection welding, as shown, the main spindle steel being copper brazed. It is hoped that developments will enable this also to be welded.

Fig. 2. This Gear Wheel Comprises a Nylon Rim and a Steel Disc to which a Shaft is Copper-brazed, and a Crankpin Projection-welded

The point to be stressed is that at both stages the best possible process or combination of processes was selected, due account being taken of developments during the intervening period.

BRAZING OF HEAT-RESISTING ALLOYS AND NEWER ENGINEERING METALS

In the brazing field, the greatest national effort since the war has been directed towards the joining of stainless-steel and the high nickel/chromium heat-resisting metals for the gas-turbine industry. Later, attention was also turned to titanium, primarily for aircraft, and to metals such as molybdenum, zirconium, and tantalum, for atomic energy projects.

Work in connection with the brazing of heat-resisting metals was directed along two main channels: (1) The development of new brazing alloys to provide improved joint strength and properties, particularly at the high temperatures for which the metals were intended. (2) The development of brazing techniques which would reduce or remove, preferably without flux, the extremely tenacious oxides present on these metals, so that "wetting" by the brazing alloy could take place.

While development work on brazing alloys is still being actively pursued, several are now avail-

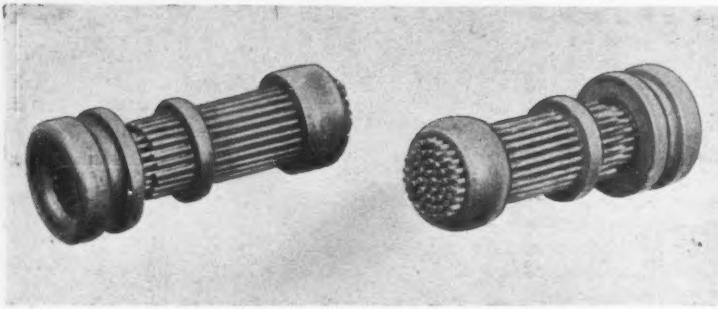


Fig. 3. An Assembly Comprising Small-bore Stainless-steel Tubes, Copper-brazed to End and Intermediate Plates

able which go far towards meeting the high-temperature requirements. For instance, tests indicate that joints in Nimonic 90, at 800 deg. C., can be expected to have a static shear strength of 16-19 tons per sq. in. and a stress/rupture life of more than 1,000 hours at 2 tons per sq. in. It follows that sound designs for high-temperature service are possible.

BRAZING TECHNIQUES FOR STAINLESS STEEL

The requirement of flux-free brazing of these metals naturally demanded the development of special techniques involving the use of furnaces with special atmospheres, capable of reducing or removing the refractory oxides mentioned, also of maintaining these pure atmospheres at the high temperature of 1,100-1,250 deg. C. required for the new brazing alloys.

The best reducing atmospheres are pure dry hydrogen and the hydrogen/nitrogen mixture obtained by "cracking" anhydrous ammonia. The atmosphere gas must not contain more than one or two parts of oxygen per million and it must be adequately dried. Laboratory tests established that normal 18/8 austenitic stainless-steel could be "wetted" and brazed at 1,150 deg. C. in purified hydrogen, provided that the dryness was equivalent to a frost-point of −30 deg. C. or lower.

Since such atmospheres can be readily produced with a frost point of −40 deg. C. and commercially dried to −50 deg. C. and better, it was wrongly assumed that there would be no practical difficulties. Minute quantities of water vapour or oxygen will, however, alter the frost point from −50 to −30 deg. C. and the problems of piping the gas to the furnace, of dealing with any air or moisture which enters with the work, of preventing any leakage, and of dealing with the oxygen from the oxides or the work and jigs, were not easily solved. In this connection, it may be noted that satisfactory designs of pit-type, sealed box, and even conveyor-type furnaces, are now available and have been in operation for some years.

EXAMPLES OF STAINLESS-STEEL BRAZING

Fig. 3 shows a typical stainless-steel assembly which is copper-brazed in large quantities in one of the conveyor furnaces.

This small unit incorporates some 60 tubes, of 0·012-in. bore, brazed to one intermediate and two end plates. All joints must be leak tight and no tubes must be accidentally blocked. Quite apart from the problem of flux-free brazing, considerable ingenuity was required in jigging this unit and in devising satisfactory methods of applying exactly the right amount of brazing metal in the right places. Ultimately, nearly a thousand units were assembled and brazed by female operators with practically no failures.

An example of the application of one of the new nickel/chromium/boron brazing alloys is

Fig. 4. Aircraft-engine Fuel/Air Starter Assembly which was Brazed with Nickel-Chromium-Boron Alloy

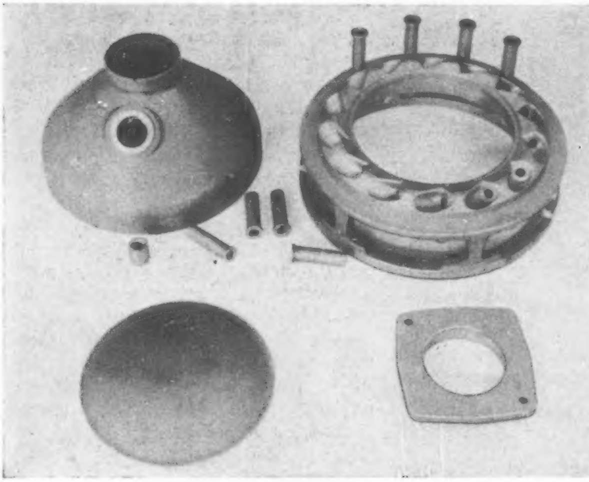


Fig. 5. A View of the Stainless-steel Components [for the Assembly in Fig. 4

afforded by the aircraft-engine fuel/air starter sub-assembly shown in Fig. 4. The components seen in Fig. 5, are of various grades of stainless-steel and were made from sheet and bar, and by forging and investment casting. The brazing alloy in paste form was applied at convenient points to the joints and excellent results were obtained in dry hydrogen. In view of the very short operating cycle of this assembly, and of the information subsequently obtained on the properties of copper-brazed joints in stainless-steel, it is now considered likely that the joints could have been brazed with copper instead of with the high-temperature alloy.

The development of these methods of brazing stainless-steel also permitted a logical progression in the design of another component. An early form of stainless-steel swirler had vanes with small tags which were spot-welded to the inner and outer sleeves. Spot-welding was the only satisfactory method at the time, but the tags interfered with the air flow, and, as soon as it was feasible, the brazed design shown in Fig. 6 was introduced. These small swirlers were already obsolescent, but the brazing method was then applied successively to various large swirlers. As these units were tending to become more complicated in shape, investment casting frequently offered a promising alternative solution. Casting techniques, however, did not always allow the heavy- and light-section parts of the assemblies to be satisfactorily produced, and the final solution was a combination of investment casting and brazing. Fig. 7 shows one typical example, where the outer member was cast in one piece and brazed to the inner member using copper in a hydrogen atmosphere. The cast inner and outer components are seen in Fig. 8.

A rather specialized field, in which brazing has

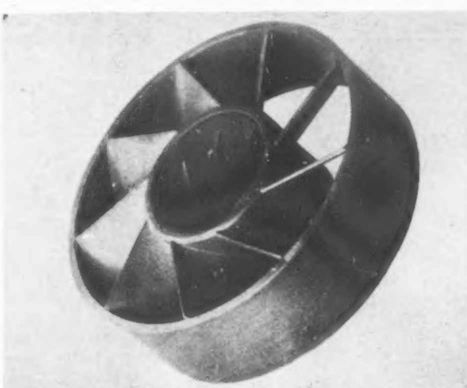


Fig. 6. A Stainless Steel Swirler in which the Blades are Secured by Copper-brazing

Fig. 7. Flame Tube Head and Swirler Assembly Copper-brazed in Hydrogen

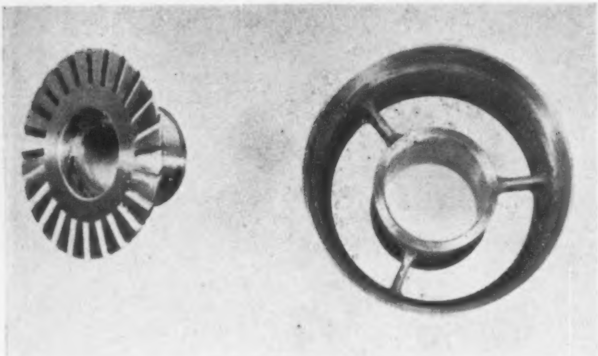


Fig. 8. Investment-cast Outer and Inner Components for the Assembly in Fig. 7

always played a vital part, is the construction of copper heat-exchangers consisting of a number of alternate layers of thin corrugated sheet and flat sheet coated with silver as a brazing alloy. During the war, salt-bath techniques and special clad brazing sheet were employed for the manufacture of similar exchangers in aluminium. Progress in stainless-steel brazing has since enabled satisfactory exchangers to be produced from this material.

For tubular exchangers in stainless steel, where a large number of thin-walled tubes fit into holes in header plates at each end, two alternative processes are now available. Each individual joint can be argon-arc welded—large-diameter tubes by standard techniques and small tubes ($\frac{3}{16}$ in. diameter or less) by a novel process known as Cone-Arc. This method enables a tube to be welded automatically without any movement of the work or welding torch, the arc itself being caused to rotate at high speed around the periphery of the tube. Fig. 9 shows the neat appearance of the welds on one type of completed unit. Unfortunately, there is some unavoidable distortion with these welding methods, for which due allowance must be made. Brazing offers a reliable and economical alternative method of assembly, particularly where a large number of joints must be made. One such unit measured approximately 10 in. by 5 in. by 14 in. long and required more than 7,500 copper-brazed joints between the tubes and the two header plates and several intermediate baffles.

BRAZING TECHNIQUES FOR NIMONICS 80, 90 AND 100

The driest hydrogen atmospheres commercially available will not effectively reduce the refractory oxide on the surface of these metals, owing to the presence of appreciable quantities of aluminium and titanium. Certain techniques have been used with some success, such as nickel-plating the components before brazing, but the most significant advance would appear to be the development of vacuum brazing.

Certain small components in the valve industry have for some years been brazed in a vacuum, but this was generally done for reasons other than oxide removal. Experimental work has shown that the oxides of all the metals discussed here can be effectively removed, and the surfaces made suitable for brazing, by carrying out the operation in a vacuum of the order of 10^{-5} mm. mercury. The mechanism here is not one of oxide reduction, but probably of oxide absorption by the parent metal.

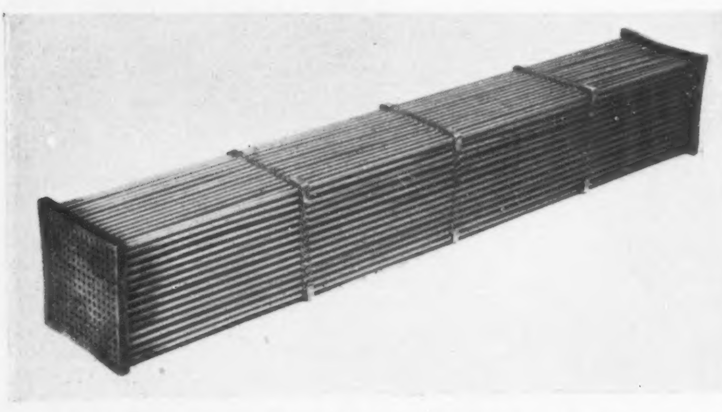


Fig. 9. Tubular Heat Exchanger of Stainless-steel. The Tubes are "Cone-arc" Welded to the Header Plates

By this method, many satisfactory joints have been consistently produced, free from porosity and unbrazed areas, and the technique is undoubtedly the most re-

liable for brazing these "difficult" metals. The work is now in the application development stage, and vacuum brazing will certainly offer fresh scope to designers in the new industries.

Apart from the brazing of these high-temperature metals, vacuum is an obvious choice for metals such as titanium, zirconium, and tantalum, all of which suffer from the disadvantage, that when heated in air or in any active gas, they absorb gases very rapidly and thereby lose their properties.

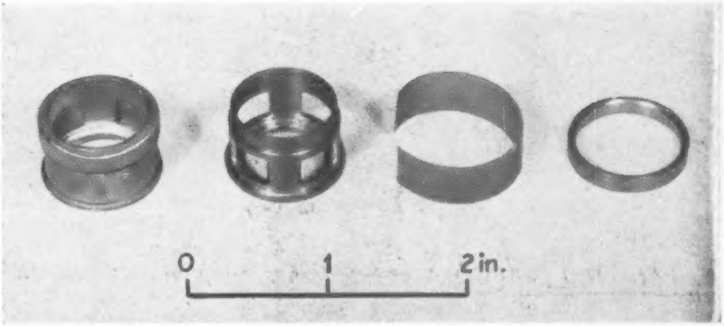


Fig. 10. Filter (left) Assembled from the Components at the Right by High-frequency Induction Brazing with Low-temperature Alloy

HIGH-FREQUENCY INDUCTION BRAZING

So far, attention has been devoted mainly to furnace brazing, where the whole of an assembly is heated to brazing temperature. If localized heating is desirable or essential, high-frequency induction is an obvious choice. This method of heating can be used in conjunction with flux, reducing atmospheres, or vacuum.

The small filter shown, with the component parts, in Fig. 10, is a good example of work for which very accurately localized heat is required. The filter element is of perforated nickel-clad copper sheet, 0·005 in. thick, rolled to size and silver-alloy-brazed along the lap joint. This element is slipped over the main body and held in place by the small brass retaining ring. A pre-fluxed ring of low-temperature silver-brazing alloy is previously placed in position on the body, and the assembly is heated by a special concentrator supplied by a small high-frequency generator. The heating time is accurately controlled to produce the joint at the top without heat spreading down the filter, which might cause the brazing alloy to flow into and block some of the holes. Only with such an accurately timed localized heating method can consistent results be obtained when brazing assemblies of this nature.

The use of hydrogen atmosphere, and later of vacuum, in conjunction with localized induction heating has progressed steadily and an excellent example of work carried out in this manner is the assembly of thin-walled stainless-steel bellows. Originally, corrugated bellows were brazed to the end pieces by induction heating in air, using flux, as this method permitted localized heating without over-heating the bellows wall. Joints were reasonably satisfactory and the method is still used, but has the disadvantage that corrosive flux residues trapped inside after brazing are extremely difficult to remove. With the correct vacuum or atmosphere conditions, such joints can be made without flux, using the same method of heating. The general quality of the joints produced in this way is more consistent and there is no problem of flux removal.

RESISTANCE BRAZING

It is possible to produce even more localized heating of components, in some instances, by the judicious use of resistance heating. Various techniques have been developed and applied to different problems, and some of the most interesting, although rather specialized, have been concerned with the making of electrical joints in small

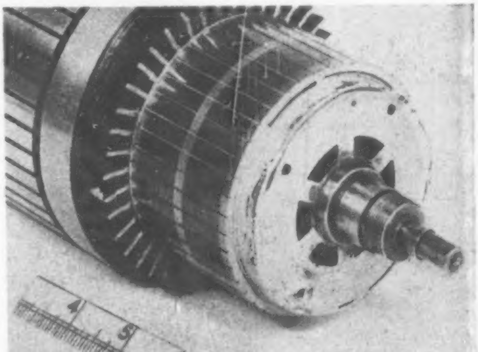


Fig. 11. Heavy-duty Armature with Conductors Resistance-brazed to the Commutator

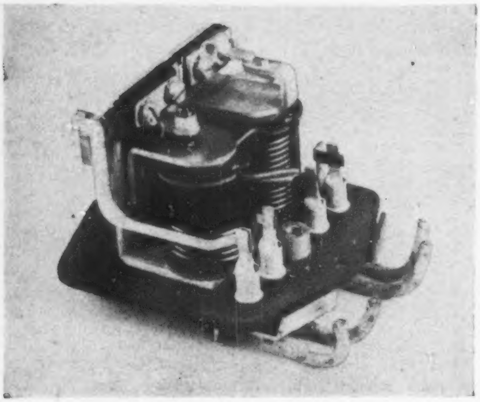


Fig. 12. Voltage Regulator with Terminal Connections Designed for Resistance Brazing

but relatively heavy-current, special-purpose motors, switches, and relays.

For some time, the lack of strength of soldered joints, particularly at high temperatures, has been an embarrassment to designers of heavy-duty electric motors and generators. The use of direct resistance heating has enabled a very sound technique to be developed for brazing commutators. Fig. 11 shows an armature in which two copper strip conductors are brought out directly on to each commutator segment. With an equivalent soldered design, the conductors would have been let into slots in the commutator risers. In a special machine, which is basically a resistance welder, two electrodes are arranged to come into contact, one with a commutator segment and the other with the top conductor associated with it. Shims of silver-copper-phosphorus brazing alloy, which is self-fluxing on copper, are placed between the two conductors and between the conductor and the segment. The two joints are brazed in approximately 1½ sec., and, with proper attention to electrodes and cooling, there is virtually no heat spread and no disturbance to the commutator. When such techniques are used, commutator joints are no longer the limiting factor in relation to the operating temperature of the machine.

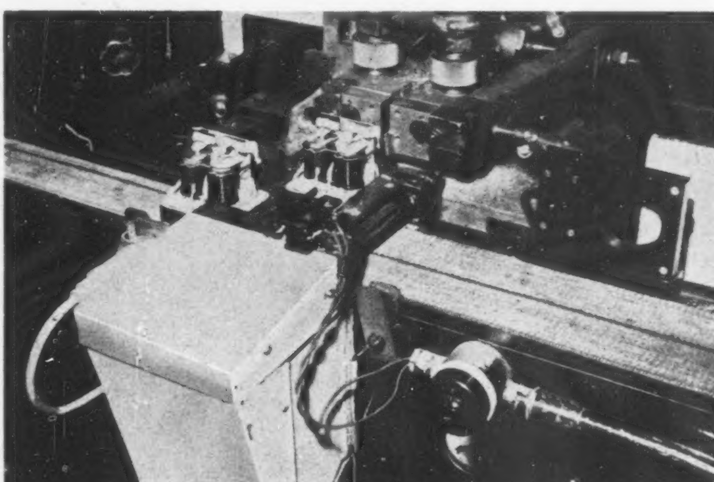


Fig. 13. A Resistance-brazing Station in an Automatic Assembly Line for Regulators

Considerable development work carried out with a view to eliminating soldering on a wide range of other products resulted in a new system of brazing electrical connections, electroplating, for example, with silver or zinc, being employed to provide the brazing alloy at the point of contact of the parts to be joined. Thus, a joint between a brass component and a copper conductor can be made by silver plating the brass. On heating, a silver-copper eutectic alloy is produced locally, and forms the joint.

In recent years, many products have been designed for connections made by these methods. A typical example is the voltage regulator shown in Fig. 12, at the front of which various copper wires and strip, also steel strip, are joined to formed terminals made from silver-plated brass sheet. A fifth joint at the rear of the unit, between steel, copper, and steel strips, is made by zinc plating the two steel strips. Where quantities are small, the joints are made in operator-fed machines. For large quantities, however, where the conditions are suitable, flow-type assembly lines can be arranged, with various welding stations at which the work is automatically stopped, the appropriate joint offered up to the electrodes and welded, and the

assembly released to the line, with no manual handling. Fig. 13 shows one of the stations in such a line for assembling an earlier type of regulator.

These examples indicate the extent to which some of the brazing processes have progressed simultaneously with developments in other forms of joining. The advantages to be gained from a detailed consideration of each joint, with a full knowledge of the possibilities and limitations of the different processes, are obvious.

A designer can hardly be expected to keep himself informed of all developments which are taking place, or to have a full knowledge of all the processes. Advice should, wherever possible, be sought from specialist welding engineers. However, it is important that designers should have a working knowledge of the joining processes and it is an added advantage if the specialist has a direct responsibility in connection with design. With this form of liaison, the best results can be achieved in the solution of any immediate problem. What is equally important, a continual impetus will be given to development work aimed at providing solutions to future problems.

ACKNOWLEDGEMENT

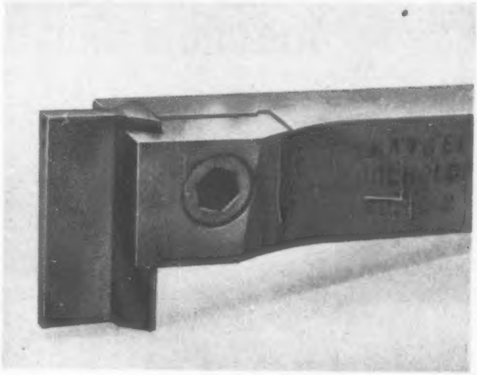
The author wishes to thank the directors of Joseph Lucas, Ltd., for permission to publish the information contained in this paper.

Kaybee Parting Tool and Holder

The Kaybee parting tool and holder shown in the figure have recently been introduced by A. & T. Knott Bros., Ltd., Mill Works, Mill Road, Lewisham, London, S.E.13. This holder, which is of hardened steel, in conjunction with the clamping piece, provides a dovetail groove for the reception of the parting blade. Clamping pressure is applied by a single socket-head screw, and it is stated that although a secure grip is obtained, for normal operation, in the event of overloading, the blade will slip down so that damage is avoided.

When mounted in a tool-post, the holder may be clamped immediately behind the blade to reduce overhang, the use of packing piece being recommended. The blade may be positioned within 0·275 in. of a collet face, and the form of the shank is such as to avoid interference with an adjacent tool in a square turret-type post.

One size of holder is at present available and there are four interchangeable blades for parting off 1-, 1¼, 1½, and 2-in. diameter material, also three sizes of part-off and chamfer blades. The blades are made of 20 per cent tungsten, 10 per cent cobalt high-speed steel. The small blade has a height, when new, of 1½ in., and the remainder, of 1¾ in., so that frequent re-sharpening is possible. Standard clearance angles are provided through the length of the blade so that it is only necessary to grind the top rake face. Back clearance is confined to the leading portion, the remainder being parallel, in plan, to provide increased strength.



The Kaybee Parting Tool and Holder

One of the advantages claimed for the tool is that the blade may readily be removed for sharpening, and replaced, without disturbing the holder. In addition, it can be conveniently set for height.

New Philips Gas Refrigerating Machine.—The range of gas refrigerating machines made by N. V. Philips, Eindhoven, Holland, has been extended by the addition of a new unit known as the type PW 7050. This machine incorporates a nitrogen separation column which enables air to be liquefied and separated, at atmospheric pressure, at the rate of four litres of liquid nitrogen per hour. It is stated that the machine can be operated continuously for a period of one week before it requires to be de-frosted.

Fully-automatic in operation, the equipment requires no supervision, and because the air is cooled at atmospheric pressure, in a single stage, and does not pass through any moving parts, the risk of contamination is virtually eliminated. Liquid nitrogen has many applications in industry, and is employed, for example, for cooling parts to facilitate fitting; hardening; annealing and accelerated ageing. Research and Control Instruments, Ltd., Instrument House, 207 King's Cross Road, W.C.1, are the sole distributors for Philips gas refrigerating machines in this country.

Autoflow Machine for Automatic Vapour Blasting Treatment

In an article published in MACHINERY, 90/508—8/3/57, was described an attachment to be fitted to the door of a standard vapour blasting cabinet, in the range made by Abrasive Developments, Ltd., Henley-in-Arden, Warwickshire, for the treatment of small components by a combination of barrelling and vapour blasting. Since that time, a considerable amount of development work has been undertaken by the company and has resulted in the construction of the double unit shown in Fig. 1, specifically for this work. One of the greatest difficulties associated with the application of the vapour blasting process to small components is in holding and presenting them to the blast stream, and the machine shown is designed to solve this problem. During the investigations, it was found that, provided the vapour blasting treatment could be effectively applied, the time required was so short that very little purpose was served by the use of barrelling chips for smoothing of component surfaces. These chips, in effect, only provided support for the work against the blast stream, and they were not always the most suitable media. Accordingly, experiments were carried out with other materials, and it was confirmed that the main function of the chips was to support the components and allow them to move about, so that they did not turn in one mass but presented different surfaces to the blast as they passed through it. One of the most successful charges was found to be rubber balls of a size which varied between ½ and 2 in. diameter. These balls were specially made for the purpose and were filled with lead oxide to make them heavier and to prevent excessive movement in the blast stream. The machine consists of two standard Autoflow vapour blasting cabinets combined into a single unit, so that one side may be loaded while work in the other is being treated. A view inside one of the cabinets, which are of similar construction, is given in Fig. 2, and it will be seen that the barrel is of slatted construction to allow the abrasive-water mixture to escape.

The barrel shown has a diameter and width of 30 in., and is supported at one side only, on a shaft which passes through the outer wall of the cabinet. This shaft is driven through a Croft's hydraulic variable gear which provides a speed range from 0 to 20 r.p.m., the speed in use being shown on a tachometer dial at the front of the sheet metal housing for the driving gear. Steel bars which comprise the barrel slats are held in the barrel sides by socket head screws and are covered with rubber tubing which takes up the shape of the slats. When

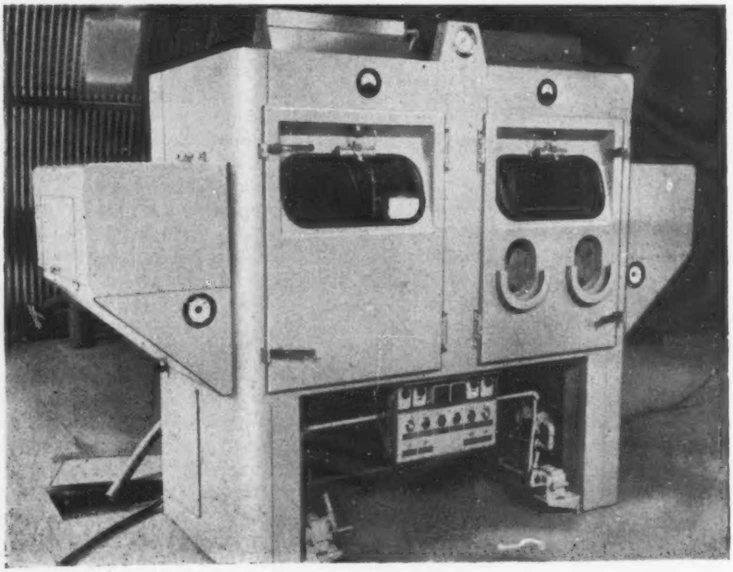


Fig. 1. General View of the New Autoflow Machine for the Automatic Vapour Blasting of Components which Cannot Easily be Held in the Blast Stream

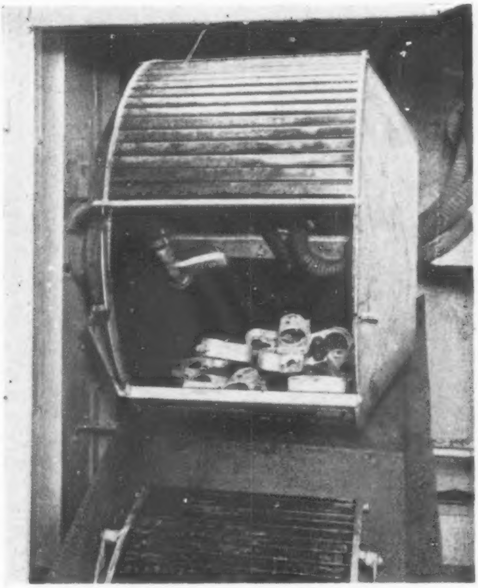


Fig. 2. Each Cabinet of the Machine Contains a Barrel Formed from Rubber-covered Slats which Allow the Abrasive-water Mixture to Flow Out into a Sump Beneath

wear occurs, the rubber can be easily replaced. The inner surfaces of the barrel sides also are lined with wear-resisting rubber. One portion of the barrel is made in the form of a removable door, as seen in the foreground, to permit of loading, and during blasting it is held in position by quick-acting clamps at each side.

The metal bars which hold the two halves of the barrel together project slightly beyond the slat level inside the barrel and cause the mass of parts to break away from the slats as the barrel rotates, thus ensuring that it is not carried too far up the ascending side. The unsupported side of the barrel has a hole through which a bracket, secured to the inside surface of the cabinet, projects. As seen in Fig. 2, this bracket carries the two guns employed for the vapour blasting operation, which are so arranged that the overlapping blast streams are directed at an angle of 45 deg. When the barrel is rotating, the surface of the mass is normal to the blast stream.

The mixture of abrasive and water, in a concentration of 40 per cent abrasive by volume, is supplied under pressure to the guns by a new design of glandless centrifugal pump, which is shown in Fig. 3. Normally driven by a 2-speed motor of 15 h.p., this pump has a life of about 2,000 hours, after which it is usually necessary only to replace the drive shaft. A new shaft can be easily fitted, and the worn shaft may be returned for chromium plating. The shaft is enclosed by a steel housing, which is also chromium plated, and there is a clearance of about $\frac{1}{32}$ in. between the two. When the pump is working, small amounts of the abrasive and water mixture can pass up through this clearance space, the pressure being reduced on the way from the normal 50 lb. per sq. in. in the volute casing to about 4 lb. per sq. in. at the top of the housing. This liquid, which seeps from the top of the housing, escapes through a pipe to the cabinet sump. Within the rubber-lined volute, there is a double-sided impeller of hard rubber, and the volute lining is continued over the edges on to the flange faces.

Thus, the joint between the two halves of the

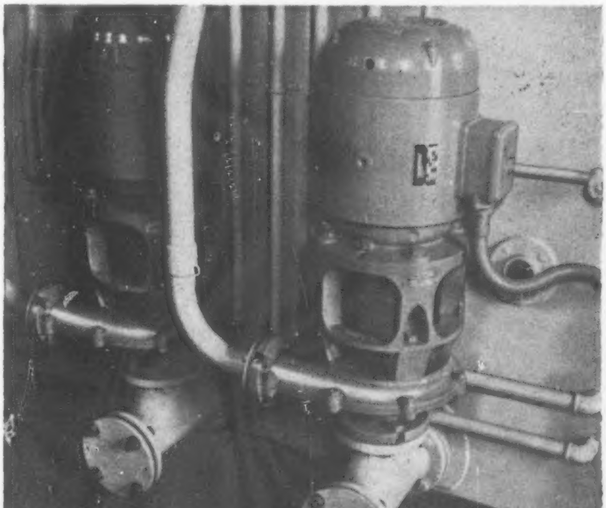


Fig. 3. From the Machine Sump, the Abrasive-water Mixture is Delivered to the Guns Under Pressure by a New Design of Glandless Centrifugal Pump Driven by a 2-speed Motor

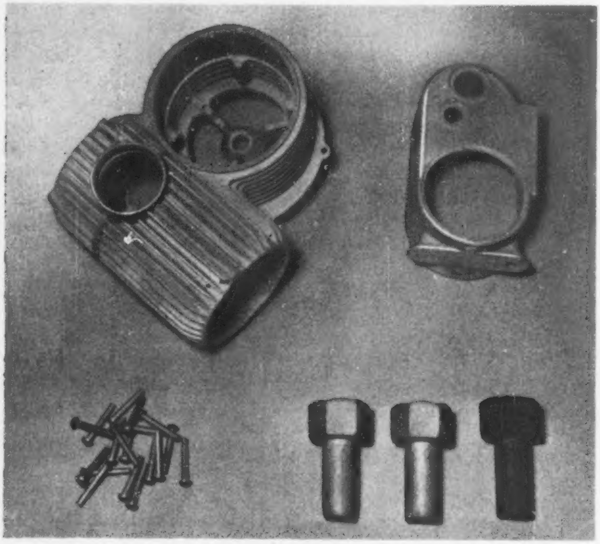


Fig. 4. Some Examples of Components, Suitable for Treatment in the Barrel Vapour Blasting Machine, which would Otherwise be Difficult to Process Automatically

volute casing is made between two thicknesses of rubber and there is no need for gaskets in assembling the unit. The size of the impeller is varied to give different rates of flow and with the 50 lb. per sq. in. pressure quoted, a delivery rate of about 150 gallons per min. is obtained with a motor speed of 3,000 r.p.m. At the lower speed, of 1,400 r.p.m., the volute pressure is reduced to 20 lb. per sq. in., and the delivery to 75 gallons per min. Change of motor speeds, in conjunction with compressed air, as explained in MACHINERY, 90/508—8/3/57, enables the action of the blast stream to be varied to suit the material treated, its original condition, and the finish required.

The plant is arranged for operation on an automatic cycle which is controlled by means of an electric timer after the barrel has been filled and two push-buttons on the central panel at the front of the machine have been pressed, to start the pump and barrel driving motors. The supply of compressed air (if employed) to the guns is controlled by a solenoid valve, and after the plant has been in operation for the pre-set period the pump and driving motors, also the compressed air supply, are automatically shut off. Other push-buttons on the central panel provide for inching the barrel to bring the door into position for loading, and there is also a switch for the fluorescent lighting unit inside the cabinet. As will be observed from Fig. 1, the door in the right-hand cabinet is fitted with rubber gloves for the insertion of an operator's hands, should it be required to carry out vapour blasting in the conventional manner.

Water and abrasive mixture which drains out through the slots in the barrel passes down into a sump in the cabinet base and returns to the pump. Before leaving the sump, the liquid passes over a magnetic plate so that any small steel parts which have been carried over are collected.

In addition to the pressure die cast aluminium alloy cine camera bodies seen in the barrel in Fig. 2, which are normally difficult to treat automatically because of the problems of holding them in the blast stream, other similar, light-weight, components may be vapour blasted in the plant. Some examples of parts which have been treated are illustrated in Fig. 4, where the cine camera body is seen at the upper right, together with a projector motor housing. These parts are treated for the removal of thin casting flash and to impart a matt surface which will increase the adherence of the paint film. At the lower left are some steel rivets, and at the right, hot-forged stainless steel bolts, one of them in the untreated condition.

NEW COAL MINING MACHINE. A Goodman continuous mining machine of a design which, it is stated, has been developed to a high stage of efficiency in the U.S.A. from a British coal-getting machine, has recently been assembled, with all-British electrical equipment, by Distington Engineering Co., Ltd. This company is a subsidiary of The United Steel Companies, Ltd., who are the sole licensees for the United Kingdom.

The cutting mechanism comprises two large 4-armed rotors and an outer chain, both the rotors and chain being equipped with cutting picks of exceptional hardness. Penetration of the coal face takes place at the rate of 10 to 15 in. per min. over an area 7 ft. 6 in. high by 13 ft. 6 in. wide. Simultaneously, the cut coal is automatically fed back through the centre of the machine to a discharge conveyor. In an American mine, the machine has proved capable of producing from 600 to 1,000 tons of clean coal per shift, working 24 hours a day.

New Production Equipment

Granor 15½-in. Centre Heavy-duty Break Lathe for the National Coal Board

In the coal mining industry, there is a considerable variety of machinery to be maintained, and the National Coal Board are erecting new Area Central Workshops and introducing planned maintenance schemes throughout the industry. A 24-hour, 7-day week, repair service is provided by the workshops, for which a variety of plant is required.

Graham & Normanton, Ltd., Exmoor Street, Halifax, are building, for these workshops, a number of 15½-in. centre heavy-duty break lathes, of a design developed in co-operation with Mr. N. C. Corless, of the National Coal Board's Engineering Workshops Division, Manchester. The accompanying Fig. 1 shows the first of these lathes, installed in the maintenance workshops at Haydock, and in Fig. 2 is shown a set-up for machining railway wheels with the aid of the auxiliary bed.

The lathe has a 14-ft. long sliding bed, and admits 11 ft. between centres with the break closed, and 18 ft. with the break open. Work up to 24 in. diameter can be swung over the saddle, and up to 7 ft. diameter by 7 ft. wide in the break.

Drive is taken from a 20-h.p. constant-speed motor, through multi-vee ropes to the headstock driving pulley, which runs at 350 r.p.m. The motor is equipped with an electro-dynamic plugging relay switch, and the main spindle can be started, stopped or inched from push-button units on the headstock and on the saddle.

There are 18 spindle speeds, ranging from 1 to 120 r.p.m., in slow, medium, and fast groups. For slow speeds, from 1 to 4·1 r.p.m., final drive is taken through a pinion and large internal gear ring at the back of the faceplate, and for medium speeds, from 5·6 to 22·2 r.p.m., through a pinion and large external gear on the spindle flange, the fast speeds, from 30·4 to 120 r.p.m., are provided directly by the spindle.

Speed changes are obtained through sliding gears cut from forged blanks of nickel-chrome-molybdenum steel. The gear-shifting arrangements are interlocked mechanically, and lever-operated reversing mechanism is built into the headstock for the feed and screwcutting motions.

A 5-ft. diameter heavy-section faceplate is mounted on the spindle nose and carries four double-type heavy-duty jaws, for gripping work either internally or externally. Automatic pump lubrication is provided to the gears and bearings from a reservoir in the base of the headstock.

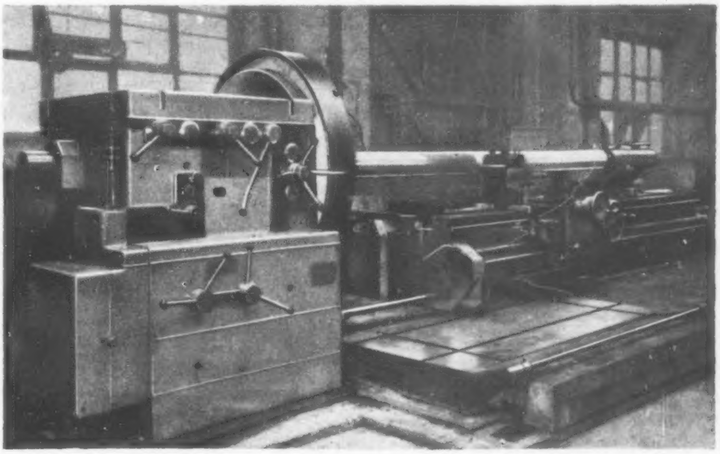


Fig. 1. Graham & Normanton 15½-in. Centre Heavy-duty Break Lathe Supplied to the National Coal Board Maintenance Workshop

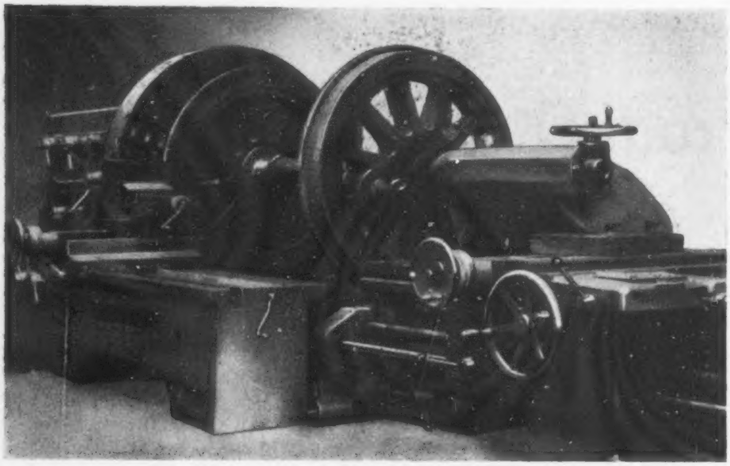


Fig. 2. Set-up for Machining Railway Wheels with the Auxiliary Bed on the Granor Lathe

Power is transmitted from the feed gearbox to the apron by a shaft which leads to a pick-up housing on the sliding bed, with provision for selecting feed-shaft or lead-screw drive. From the pick-up housing, power is transmitted to the apron through a 1½-in. diameter feed-shaft, or a 2½-in. diameter lead-screw, the latter being accurate for pitch within 0·0015 in. over any foot throughout the length.

Of the double-wall type, the apron has one lever for selecting the sliding, surfacing or screw-cutting motions. All the apron gearing is of steel, apart from the phosphor-bronze worm-wheel, and the guided cast-iron half-nut for the screw-cutting motion has a phosphor-bronze liner.

A saddle lock is provided for use when surfacing. The tool-post is of the four-bolt and plate type, and the long compound slide is graduated for swivel adjustment through an angle of 90 deg. in each direction for taper turning or conical boring with hand feed. When required, the compound slide can be used on the auxiliary bed saddle.

The tailstock has cross-adjustment for taper turning, and the 5-in. spindle, of the straight-through type, is adjustable by handwheel, worm and worm wheel. Additional support and guidance are afforded for the tailstock by extending the base over the rear of the bed on to a V-way, to prevent tilting under heavy loads.

The 22-in. wide by 7-ft. long auxiliary bed can be mounted on the extension baseplate either parallel to the sliding bed, for turning large diameter workpieces in the break, or at right angles, for facing operations. A saddle, which has a movement of 5 ft. 6 in., can be traversed by hand from either end of the auxiliary bed. In addition, power feed can be obtained by way of a connecting link and chain from the main feed-box to a ratchet mechanism on the end of the feed screw. This arrangement provides 32 rates of feed ranging from 10 to 400 cuts per in. A pillar-type toolpost is available for machining crankshaft bearings.

The approximate weight of the lathe is 19 tons, and the height from the floor to the centres is 4 ft. 3½ in.

Of forged high-carbon steel, the spindle runs in parallel gun-metal bearings and the end thrust is taken on ball races mounted on each side of the rear bearing. It is bored 5¼ in. diameter, and a tapered bush is fitted in the nose to receive a No. 6 Morse taper centre. The front bearing is 9 in. diameter by 10 in. long and the rear bearing, 7 in. diameter by 6¾ in. long.

A casing provides total enclosure for the feed and screwcutting drive from the headstock, and the swing plate for the screwcutting change wheels is housed in the lower half of the case. The gear-box gives eight rates of sliding feed for the sliding bed saddle, from 8 to 96 cuts per in., and eight surfacing feeds, from 24 to 288 cuts per in. In conjunction with change wheels, Whitworth threads from 2 to 28 per in., and Metric threads from 1 to 14 mm. pitch can be cut. A safety coupling on the outside of the feed-box prevents damage in the event of over-running or over-loading.

A deep, well-ribbed baseplate is provided for locating and securing the sliding bed unit. A side facing on this baseplate receives the extension base-plate which carries the auxiliary bed. Of the 4-shear type, 3 ft. 8 in. wide, the sliding bed has two front ways which form a narrow guide for the saddle, and two rear ways for the tailstock, the latter being so designed that the saddle can be traversed past it.

Adjustment of the sliding bed on the baseplate is obtained, through a screw and nut, from a gear-box and 3-h.p. motor with push-button control. A hand ratchet lever movement is also available.

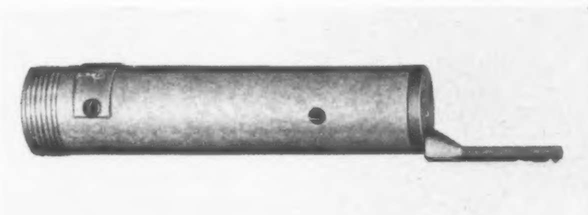
Type LK Tracer Head for Profilometer Surface Finish Measuring Equipment

In the figure is shown the new type LK tracer head, introduced by the Micrometrical Manufacturing Co., Ann Arbor, Michigan, U.S.A., for use with their Profilometer portable surface finish measuring equipment.

The Profilometer instrument enables measurement of surface-finish irregularities to be made in terms of r.m.s. or the c.l.a. values, and comprises a combined high-stability electronic amplifier and dial-type indicator which gives full-scale readings from 0 to 3 up to 0 to 1,000 micro-inches in six ranges. Details of the instrument, and some of the numerous tracer heads which are available for traversing over the work surface by hand, or automatically by means of motor-driven guiding units, were given in MACHINERY, 86/827—15/4/55.

Intended for operation by hand or for connection to the company's Mototrace automatic traversing equipment, the new tracer head may be fitted with the type FT skid unit, as shown, which enables bores as small as ⅛ in. to be checked over depths from $\frac{3}{16}$ to $\frac{11}{16}$ in. Holes down to $\frac{11}{16}$ in. diameter can be checked for a maximum depth of 2⅞ in., and the entire assembly can be passed through a bore of only ¾ in. diameter. It may also be employed for measuring irregularities on flat surfaces and external diameters down to ⅛ in.

Alternatively, the tracer head may be fitted with the type FL or type FM skid unit. As was mentioned in MACHINERY, 89/739—28/9/56, each of these units has two skids which straddle the probe, and the type FL may be used on flat surfaces and in bores down to ½ in. diameter where the length is not less than $\frac{3}{32}$ in. The type FM skid unit is intended for the measurement of irregularities on external diameters of ⅝ in. and over. In addition, these skid units may be employed when checking surfaces of narrow slots and splines, also gear teeth with diametral pitches down to 10, and face widths as small as ¼ in.



The New Type LK Tracer Head for Profilometer Surface Finish Measuring Equipment

Gaston E. Marbaix, Ltd., Devonshire House, Vicarage Crescent, London, S.W.11, are the selling agents in this country for Profilometer surface-finish measuring equipment.

Besco Type HB.24 Horizontal Band Sawing Machine

F. J. Edwards, Ltd., 359-361 Euston Road, London, N.W.1, have introduced an inexpensive horizontal band sawing machine, shown in the

Besco Type HB. 24 Horizontal Band Sawing Machine

accompanying illustration, which has been specially designed for cutting out plastics shapes after they have been formed from sheet by the vacuum process.

Know as the type HB.24, this machine incorporates a motor-driven band saw which runs horizontally in a fixed plane, and the work is clamped on a table arranged to traverse on rollers in a direction at right-angles to the saw. Work clamping is effected by a frame which is secured to the table by two spring-loaded hinges and a central locking lever at the opposite edge, so that plastics sheets of various sizes up to 24 in. square and thicknesses up to ¼ in. can be evenly clamped. Very thin sheets—for example 0·005 in—can readily be clamped by the use of a mask cut from cardboard, plywood

or sheet metal, which is placed between the work and the frame. To provide a firmer grip, spring-loaded bars may be located between the shapes to be cut.

The height of the table in relation to the saw is adjustable by means of a handwheel beneath, and feed of the work on to the saw is effected by a handwheel at the side of the machine. A butt-welding attachment for repairing the saw blade can be fitted to the machine, if required.

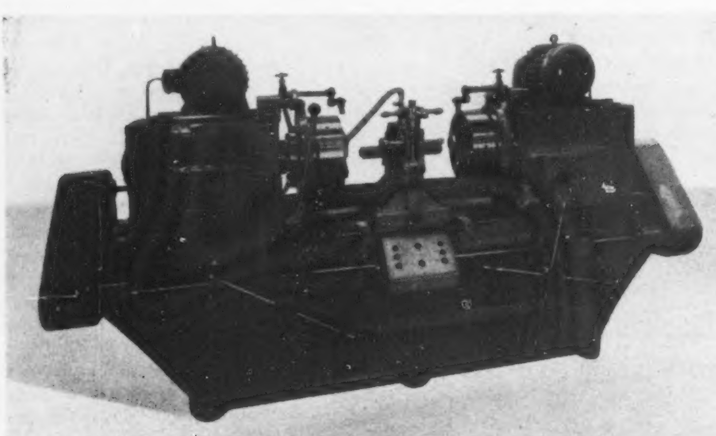
Heap Duplex Threading Machine for Railway Coupling Screws

The duplex machine shown in the figure has recently been built by Joshua Heap & Co., Ltd., Oldham Road, Ashton-under-Lyne, for British Railways for cutting right- and left-hand threads, simultaneously, at opposite ends of coupling screws for railway rolling stock. The 50-mm. ($1\frac{31}{32}$-in.) diameter coupling screws are made from En. 16T steel, and the 7-mm. pitch metric threads, which conform to an international standard, are produced at a single pass of the die heads, the cutting speed being 7 ft. per min.

Screw-cutting is carried out with tangential die heads of the company's standard design, which enable the coarse pitch threads to be produced to a high degree of accuracy for parallelism, and with a good surface finish. Drive to the die-head spindles is taken from separate 5-h.p. motors through V-belts and worm gearing, and nine different spindle speeds are obtainable by change gears. The spindles are mounted in phosphor-bronze bearings which are automatically lubricated by a pump, and the change gears and the worm and worm-wheel are enclosed in an oil bath.

During the actual screw-cutting operation, movement of the spindle heads on the bedways is provided by separate lead-screws which are driven from the spindles. At the end of the cutting stroke, the feed motion is automatically stopped and the die heads opened, and the spindle heads are then returned to their starting position, by hand, through racks and pinions. Provision is made, however, for fitting f.h.p. motors for power return of the heads.

The workpiece is gripped at a narrow central portion, and a peg or flats are usually provided to prevent rotation during the screw-cutting operation.



Heap Duplex Threading Machine for Railway Coupling Screws

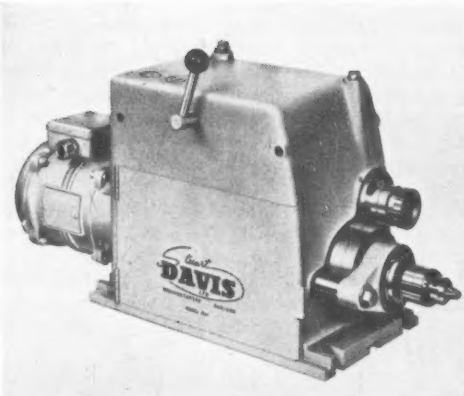
Hydroair Air-Hydraulic Drilling Unit

Shown in the figure is the Hydroair air-hydraulic drilling unit, which has recently been introduced by Stuart Davis, Ltd., Much Park Street, Coventry.

Of compact design, this self-contained unit has a capacity for drilling holes up to $\frac{5}{16}$ in. diameter in steel, and may also be employed for reaming, spotfacing, hollow milling, countersinking, chamfering, and light-duty boring. The spindle has a maximum travel of $1\frac{3}{4}$ in., and the power feed movement can be varied up to $1\frac{1}{2}$ in. It has a Jacobs No. 2 taper nose to take a drill chuck.

A direct drive to the spindle, at a speed of 700, 1,400 or 3,000 r.p.m., can be provided by a $\frac{1}{3}$-h.p., motor flange-mounted on the rear of the body as shown. Alternatively, the drive may be transmitted by a V-belt from a motor with a shaft speed of 700 or 3,000 r.p.m., which is mounted on top of the body, and variable spindle speeds from 1,100 to 3,000 or from 250 to 2,000 r.p.m. can then be obtained.

Effected by compressed air, with hydraulic control for the drilling feed, power movement of the spindle in both directions is started by means of a ball-ended lever which may be mounted on either side of the body, or, alternatively, by a foot-operated valve. If required, a push-button control unit may be attached to the body on either side in place of the lever, or, mounted



Stuart Davis Hydroair Air-Hydraulic Drilling Unit

separately for remote operation, and a fully-automatic working cycle, which can be repeated continuously, can then be obtained. The spindle can be arranged to dwell for a variable period at the end of the cutting stroke, and the driving motor may either run continuously or be stopped automatically upon completion of each working cycle. When the push-button control unit is fitted, provision is made for interrupting the feed, and returning the spindle to its starting position, at any point in the cycle.

Drilling feeds and rapid power traverse can be applied in both directions, and are varied steplessly, independently of the spindle speeds, by means of a knob mounted on the front end of the body. Alternatively, provision can be made for varying the feed in seven steps. Feed and rapid traverse movements are controlled positively by means of adjustable stops, and it is stated that the rapid travel can be repeated to an accuracy of 0·01 in., so that the drill may be brought close to the work before the feed is engaged.

The spindle has a centre height of 3¼ in., and a tenon slot, also $\frac{9}{16}$-in. wide slots to take fixing bolts, are provided in the 7-in. wide base. Suitable for mounting in a variety of positions, the unit equipped with a flange mounted motor has an overall length of 20 in. With belt drive, the length is reduced to 14⅞ in.

Scheer Type KS 5 " Economy " Portable Electric Grinder

In the illustration is shown the new German-made Scheer type KS 5 " Economy " portable electric grinder, for which Conveyor & Equipment Co., Ltd., 9 Great Pulteney Street, Piccadilly, London, W.1, are the selling agents in this country.

Resilient plastics-bonded grinding wheels up to 4½in. diameter, with a ⅞-in. diameter centre hole, are mounted directly on the shaft of the universal motor, which has a no-load speed of 13,300 r.p.m. and a power consumption of about 1 kW. Alternatively, a high-frequency motor for operation on supplies of 150, 200, or 300 cycles per sec. can be provided, if required. The high spindle speed permits the use of wheels that have been discarded after they have become worn down from the standard 7-in. size, for example, on angle grinders with lower operating speeds.

The switch for starting and stopping the motor is incorporated in the handle and is arranged so that it can be locked in the " on " position.

Scheer Type KS 5 " Economy " Portable Electric Grinder

Rubber screw-in side handles can be fitted on the right and left of the body. The grinder weighs approximately 7¾ lb.

Jacy Electronically-controlled Indexing Work Table

In the figure is shown the Jacy indexing work table and associated mobile electronic control unit which is made by the Modern Engineering Service Co., Berkley, Michigan, U.S.A.

Available in diameters of 18, 24, 36 and 54 in., with an electric or hydraulic driving motor, the

Jacy Indexing Work Table and Electronic Control Unit

table may be controlled either by push-buttons or punched tape, and is intended for use in connection with such operations as drilling, milling boring and broaching. The number of indexing divisions obtainable can be varied steplessly up to 21,600, and it is stated that settings can be repeated to a very high degree of accuracy. The indexing movement is obtained mechanically, and an arrangement for eliminating backlash in the drive system is automatically brought into use at the end of each cycle. Indexing speeds can be varied steplessly over a wide range, and the slower speeds provide for "inching" the work table.

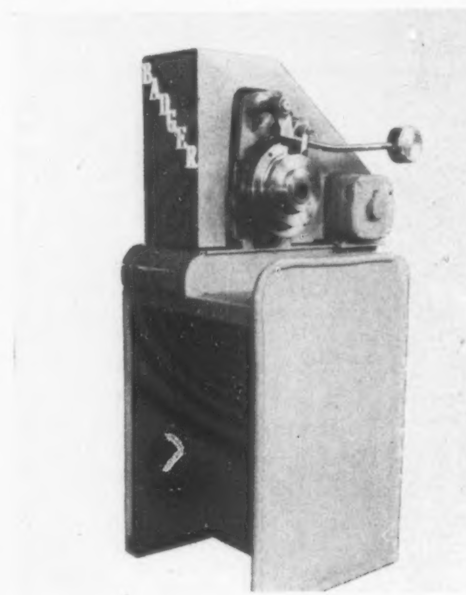
Badger Rotary Milling Machine

In the illustration is shown the rotary milling machine recently introduced by Badger Engineering Co., Ltd., New Union Street, Manchester, 4. This machine is normally semi-automatic in operation, but a hopper feed for the workpiece blanks can be fitted if required, and the working cycle is then fully automatic.

Drive from the motor is transmitted by a V-belt and 2-step pulleys to a worm reduction gearbox which carries the workhead. Of fairly small diameter, the work holder is usually driven at a speed of 1 r.p.m. but speeds from ½ to 2 r.p.m. can be provided in accordance with requirements. When a 30-station work holder, driven at a speed of 2 r.p.m., is employed, for instance, components can be handled at the rate of 3,600 per hour.

From the worm shaft, drive is transmitted to the cutter spindle by change gears, and a total of 8 speeds ranging from 98 to 1,120 r.p.m. can be obtained. The cutter spindle runs in adjustable ball bearings, and the entire assembly, which can be adjusted by a handwheel for setting the depth of cut, is automatically oscillated as milling proceeds, by an eccentric under the control of a cam at each station on the work holder. The subject of a patent application, this arrangement enables a flat surface to be produced on a part at right angles to the centre line.

A constant clamping pressure is applied to the workpieces by a phosphor bronze wedge, which is held in engagement with a convex ring on the



Badger Rotary Milling Machine

work holder by a pivoted arm, fitted with a weight at its outer end. With this arrangement, the use of springs is avoided.

Coolant is delivered to the work by a gear pump driven direct from the motor.

DIESEL AND DIESEL-ELECTRIC LOCOMOTIVES produced during the first quarter of this year totalled 234, of which 149 were rated at less than 275 h.p. Of the latter type of locomotive, a total of 73 was exported.

Die Casting Supplement

Die Making Facilities at the Works of Fonderpress, Bologna

In an article which was published in MACHINERY, 93/267—30/7/58, reference was made to some of the activities of Fonderpress Di Gamberini Tagliavini & Co., with head offices and tool-making department at Via M. D'Azeglio 19, Bologna, Northern Italy, and examples of interesting castings in current production—also the dies in which they were made—for the range of Lambretta motor scooters manufactured in Milan by Innocenti, S.p.A., were discussed. Die casting is carried out in a factory situated some distance away from the tool-making department to avoid damage to expensive machine tools from the acid and other fumes associated with melting and casting operations. The experience gained directly from these die casting operations is extremely useful in connection with the design and production of dies, and the foundry also provides facilities for die proving, before delivery.

Dies produced by the company are of very high quality and, if required, a guarantee will be given that a particular die will have a minimum life of a stated number of shots. This article is concerned with the facilities available for the production of dies, which are made for a number of other establishments, both in Italy and abroad.

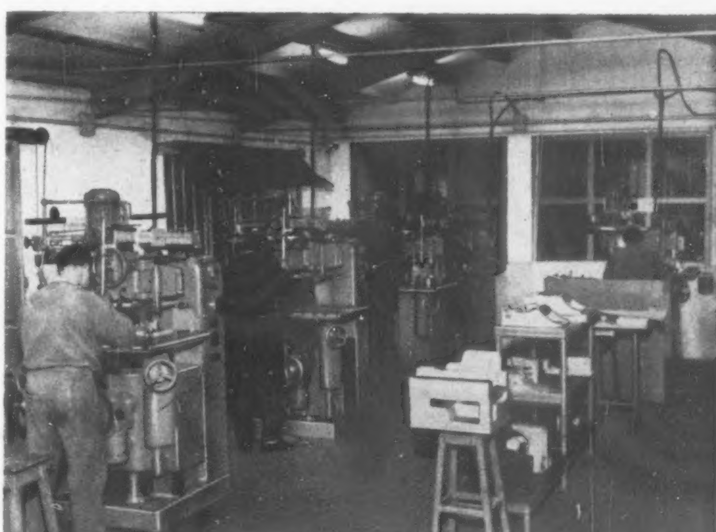


Fig. 1. For Die-sinking and Similar Work a Battery of 12 Deckel Universal Pantograph Machines, some of which are Here Shown, is Installed in a Separate Shop of the Fonderpress Tool-making Department

TOOLMAKING FACILITIES

One of the most important items of equipment in the works is a Lindner (Stedall Machine Tool Co.) type LB 15A jig borer, which is provided with the latest pre-selective Autopositioner equipment whereby the table position for the next operation can be selected while boring is in progress. There is also an Isoma (Matchless Machines, Ltd.)

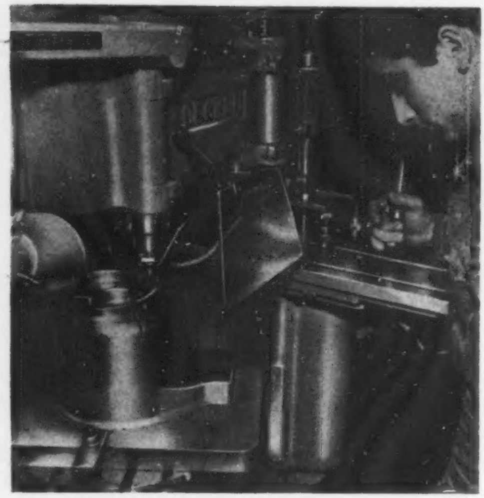


Fig. 2. Close-up View of One of the Deckel Die-sinking Machines Three Equally-spaced Slots, which will Form Strengthening Ribs on the Casting, are here being Machined in a Core for an Engine Crankcase Die

table-type projector with a lens turret which provides for various degrees of magnification up to 100×. Part of one of the most impressive installations is shown in the general view (Fig. 1) of the die-sinking shop, which houses a total of 12 Deckel (Burton, Griffiths & Co., Ltd.) KF 12 universal pantograph die sinking machines. These machines are employed for almost all the initial die-sinking work and they enable enlargements or reductions to be made in ratios of 1, 1½, 2½, 3, or 4 to 1. In the centre of the shop can be seen some of the metal and plaster models employed as masters for dies for typewriter parts and sewing machine arms.

A typical set-up on a Deckel machine is shown in Fig. 2 where three equally-spaced slots, each ⅜ in. wide, are being cut in a core for an engine crankcase die. These slots provide for strengthening ribs in the casting. The core is secured to a circular dividing table and the stylus is guided in a slot formed between two straight-sided steel blocks clamped to the pattern-support table. Separate low- and high-speed spindles are provided for rough- and finish-machining operations, and the high-speed spindle is here seen in use. Powered by a 1-h.p. motor, this spindle can be driven at speeds up to 10,000 r.p.m.

Die sinking operations on the larger mould cavities are carried out on a large Rigid (Dowding & Doll, Ltd.) copy-milling machine, and other equipment in the shop includes a Plauert-Wechsel (Selson Machine Tool Co., Ltd.) horizontal borer. There is also a number of milling machines by various makers including Heller (Wickman, Ltd.), Maserati (Soag Machine Tools, Ltd.), and Oerlikon-Italiana (Vaughan Associates, Ltd.), radial drills by Raboma (Benrath Machine Tools, Ltd.) and a variety of centre lathes and other machines. Almost all these machines are new or have been installed very recently, and the standard of the equip-

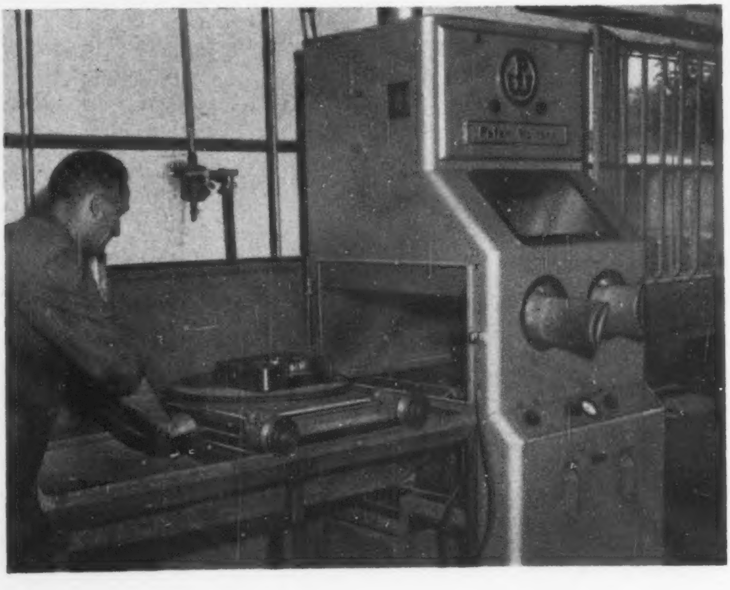


Fig. 3. Cavity and Other Die Surfaces are Finished by the Vapour Blasting Process in this Peter Wolters Cabinet, with 400-grit Aluminium Oxide Abrasive

ment is in accordance with the claims made for the quality of dies produced by the company.

VAPOUR BLASTING

Die cavities are finished by the vapour blasting process, which produces a smooth satin surface. Flow of metal is thus facilitated, and components of good appearance are obtained from new dies, no running-in period being required. The machine employed is shown in Fig. 3, where an operator is seen moving a die part into the cabinet. Supplied by Peter Wolters (Vaughan Associates, Ltd.), the machine is the smaller of two sizes made, and is designated DSL 3. The cabinet has a door at each side measuring 15¾ by 25½ in., and there is a framework of weld-fabricated angle-section steel, with V-guide rails at the top, on which the loading trolley moves.

This trolley has guide rails to carry a moving table and there are similar guide rails within the cabinet, to which the table can be transferred. At the centre, there is a turn-table to support the die part, so that it can be turned by the operator to the most suitable position for vapour blasting. Beneath the guide rails of the framework is a trough, whereby any of the abrasive and water mixture carried out of the cabinet with the trolley is returned to the sump in the cabinet base. For treatment of die cavities, a fine aluminium oxide abrasive, of about 400 grit size is employed, and the flow is accelerated by compressed air. The blasting jet is held and manipulated by hand with the aid of captive rubber gloves in two apertures at the front of the cabinet.

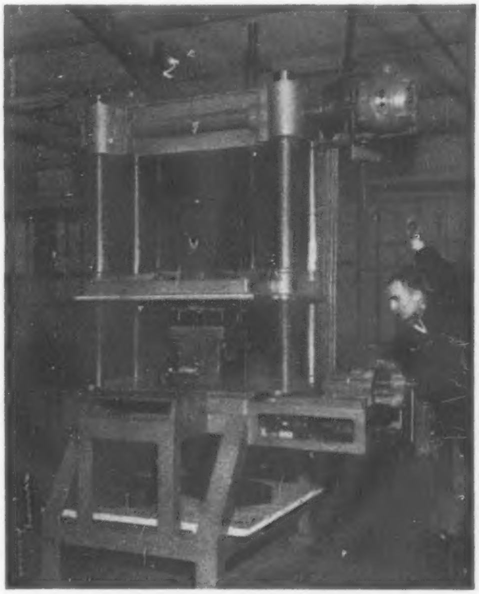


Fig. 4. Final Fitting Work on Die Casting Dies is Carried Out with the Aid of this Fonderpress-built Die Try-out Machine, on which the Moving Platen can be Actuated Either Manually or Mechanically

DIE TRY-OUT MACHINE

Final fitting and testing of the various core and other mechanisms in dies which are

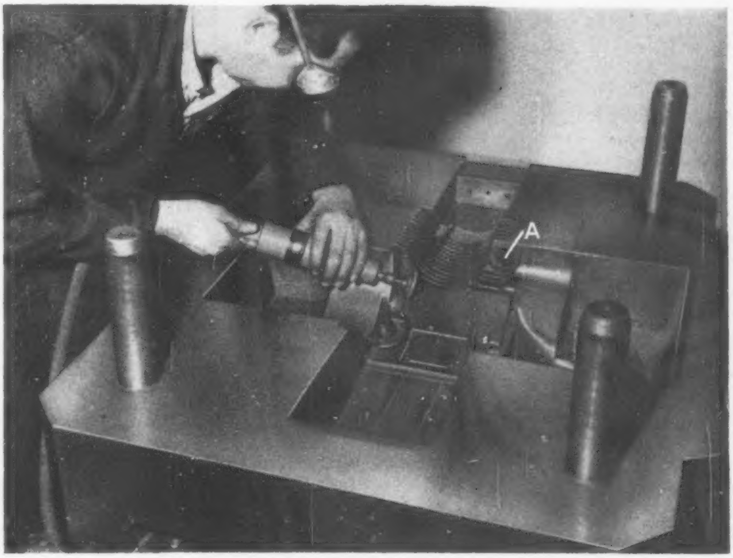


Fig. 5. Small Modifications to Dies which are Nearing Completion are Carried Out by Means of an Air-driven Spindle Fitted with an Abrasive Wheel, as Here Shown

Fig. 6. Two Castings from the Die in Fig. 5. The Cooling Fins Vary in Depth up to 2 in. and Taper to about $\frac{3}{32}$ in. at the Outer Edges

approaching completion is considerably facilitated by a special machine, shown in Fig. 4, constructed by the company. Supported on a substantial cast base, this machine has a table which represents the fixed platen at the injection end of the die casting machine. At one side of the table, there is an extension equipped with rollers, the tops of which are just above the table level, to facilitate movement of heavy dies. Another side of the table carries a bench with a vice, and a space beneath for tools, so that work can be performed on die components without leaving the machine. At each corner of the table there is a cylindrical post representing the die casting machine tie bar, and at their upper ends these posts support another fixed platen.

Between the fixed platen and the table is a moving platen to which the moving half of the die is secured, and this platen carries two screws which extend upwards through the top platen. Nuts on these screws, in the top platen, can be turned simultaneously by means of a motor, for large movements, or by hand for small adjustments, to simulate the closing or opening of the die casting machine. The opposing faces of the table and the moving platen are provided with rows of threaded holes so that dies of a variety of sizes can be easily mounted, and the length of the support posts is such that dies of all thicknesses normally used are admitted.

FINNED CYLINDER DIE

Many of the dies made by the Fonderpress toolroom are for the production of castings for internal combustion engines, and the fixed-half die shown in Fig. 5 is for a combined crankcase and air-cooled finned cylinder, to be cast in aluminium alloy. The operator, who is carrying out the final fitting, is here working on an interior surface with an air-driven portable grinder. The production of such a die, which is regarded as large, normally occupies a period of about three to four months from the date of placing the order. The construction of this die is conventional, inserts made from heat-resisting die steel being fitted into a mild steel bolster.

From Fig. 5 it will be seen that provision is made for four moving cores, arranged at 90 deg., to be fitted, and two of the aluminium alloy castings from the completed die are shown in Fig. 6. Each casting incorporates a tubular steel insert with a bore of about $3\frac{3}{8}$ in., for the cylinder, and this insert has a wall thickness of approximately 5 mm. (0·2 in.), and a flange at each end. Projections on the sides of the insert prevent it from turning in the casting. The overall height of the casting is $14\frac{3}{4}$ in., the width $7\frac{1}{2}$ in., and the diameter of the crankcase at its widest point, about 10 in. Fins surrounding the cylinder vary in depth up to 2 in., and taper to a thickness of $\frac{3}{32}$ in. at the outer edges. Small plate-type inserts are employed for those portions of the die in which the fins are formed, as will be explained later.

The hole *A*, Fig. 5, is at right angles to the parting plane of the die, and matches another hole in a symmetrically opposite position in the moving die member. These holes provide for hydraulically-actuated pin-type cores which form circular apertures in a platform at one side of the finned portion of the cylinder, as indicated at *B* in Fig. 6. The castings are shown with the slugs and runners still attached, and it will be observed that the hole in the die which communicates with the injector sleeve on the casting machine is located in the core cavity on that side of the die which is at the bottom in the operating position. This core cavity is seen on the right in Fig. 5.

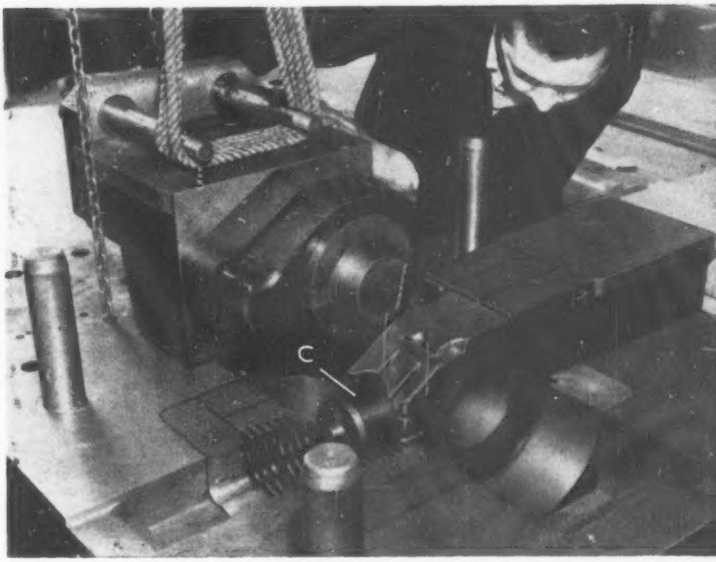


Fig. 7. Another View of the Die-half Shown in Fig. 5, with Two of the Cores. A Tubular Steel Insert for the Cylinder Bore is Located on the Spigot *C*

Another view of the die during final fitting, with the side core for the interior of the crankcase in the advanced position, is given in Fig. 7, and the core which covers the sleeve hole, and forms one side of the runner channel, is seen being lowered into place for trial. The large-diameter spigot *C* is provided for the location of the flanged tubular insert in the cylinder bore. This insert is positioned at the other end by another core, which also forms the end surfaces of the casting. Both the cores shown, and those which occupy positions opposite to them in the finished die, are, of course, carried in the moving half, being retained by guide grooves and advanced and retracted hydraulically. The weight of the casting shown in Fig. 6 is slightly more than 12 lb., when trimmed, and the complete die weighs between 3·7 and 3·8 (metric) tons.

CRANKCASE SUPPORT CASTING

The combined crankcase and cylinder casting is supported on a base which is also pressure die cast in aluminium alloy, and examples of these castings, with the slugs and runners still attached, are seen in Fig. 8. From an examination of these castings, it will be apparent that the die in which they were produced is of simple construction. Each casting has a trimmed weight of 6½ lb., and measures approximately 13½ by 6 by 6½ in. high, the thickness varying between $\frac{3}{16}$ and ¼ in., except for the strengthening ribs, which are much thinner.

The die in which these castings were made weighs approximately 2·9 (metric) tons.

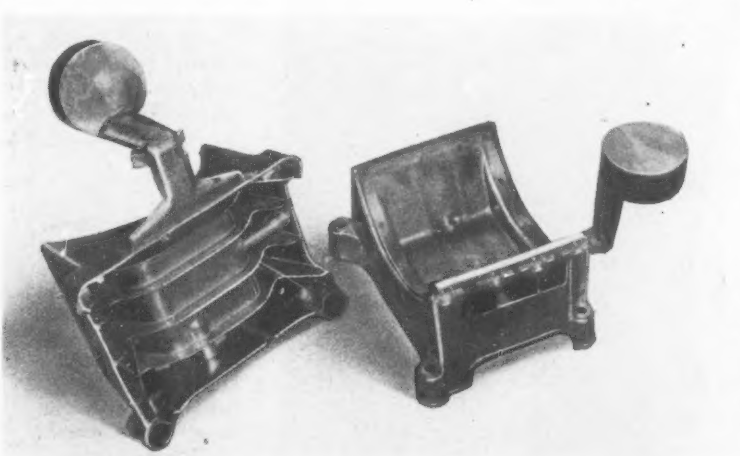


Fig. 8. Views of Base Support Castings for the Crankcase in Fig. 6, Showing the Thin Ribs on the Under-side and the Method of Gating. Ejector Pins Act on the Lower Surface of the Flanged Edge

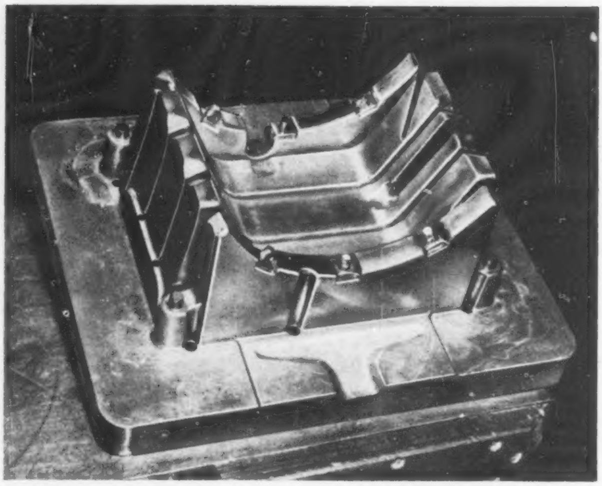


Fig. 9. The Die Insert for Forming the Ribbed Internal Portion of the Base Casting in Fig. 8 was Machined from a Solid Steel Block, and is Here Seen in the Finished Condition

and the insert for producing the under-side for is shown in Fig. 9. This insert is noteworthy for the fact that it was machined from one piece of steel and affords a good indication of the quality of the work produced by the company. It may be observed that the ejector pins are so disposed that they bear on the under-side of the casting flange, at points where the ribs join the sides, or where the sides are thickened by partly-cylindrical projections. Both these engine-component dies were designed for use on a Triulzi (Alexander Cardew, Ltd.) 16M, water-hydraulic machine, of 750 tons locking force.

DIE FOR A SMALLER FINNED CYLINDER

Another die half, for a smaller finned cylinder than that previously discussed, is shown in Fig. 10, where a casting is seen in the background. The moving half die is illustrated, and at the left are some of the plate-type individual inserts for the fixed die. Cooling fins on the cylinder are formed between the inserts, and with this construction, the difficulties of machining such thin slots in a solid block are avoided. Moreover, any mistake which is made can be rectified fairly cheaply. With this design, the time required for die making can be reduced, since several tool-makers can be engaged in the production of inserts at the same time, and air vent grooves can be cut in the face of each insert where it abuts the next, so that die venting is much improved.

The die, also, has provision for locating a tubular steel insert, with a bore of 2⅜ in., to form the cylinder wall, and a core pin, arranged at a slight angle to the parting plane, produces the hole indicated at *E*. This pin is operated, through a rack and pinion, by means of the small hydraulic cylinder at the left in Fig. 10. The interior surfaces of the

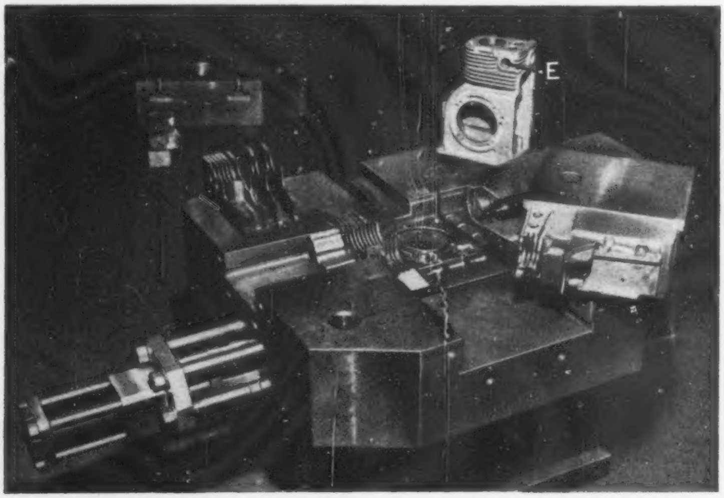


Fig. 10. The Moving Half of the Die for the Finned Cylinder and Crankcase Casting Seen in the Right Background. Individual Plate-type Inserts from the Fixed Die Half are Seen at the Left. The Fins are Cast in the Spaces Between Adjacent Inserts

crankcase portion of the casting are formed by projections on the end of the core at the right, which has been inverted from its normal position to enable the details to be seen more clearly. The cavity is gated, in the fixed die half, directly behind this core, as in the previous example. When trimmed, the casting, including the insert, weighs about 5½ lb., and the weight of the complete die, the fixed half of which is seen on the floor in the background in Fig. 10, is about 3·2 (metric) tons.

From the information given in this, and the previous, article, it will be apparent that Fonderpress operate on a substantial scale as regards both die casting and die making, and the tool-making establishment produces approximately 3½ to 4 (metric) tons of finished dies per month. In this connection it must, of course, be borne in mind that the amount of work involved per ton of die varies widely. Of the total output, approximately 50 per cent is for the company's own foundry, and the majority of dies are intended for the casting of aluminium alloys, only about 10 per cent being required for zinc.

Pressure Die Castings for a Hedge Trimming Machine

The portable electric hedge trimming machine produced by the Tarpen Engineering Co., Ltd., Coronation Road, Park Royal, London, N.W.10, incorporates three pressure die castings supplied by Dyson & Co., Enfield (1919), Ltd., Ponders End, Middlesex. A completed hedge trimmer is seen in Fig. 1, together with a sub-assembly incorporating the worm gearing whereby the drive is transmitted from the motor to the reciprocating blade. For this purpose, a pin, mounted in an eccentric position on the side of the phosphor bronze worm gear, engages a slot in a bronze block attached to the blade. Main castings for the hedge trimmer, each in two positions, are seen in Fig. 2, also one of the small cover castings for the connection recess. Of the two main castings, the smaller, at the right, provides bearings for the worm wheel, and a surface, with a rectangular opening, for the reception of the blade assembly, also a bearing for the end of the motor spindle which carries the driving worm.

This casting has a diameter of nearly 4 in. and is 3½ in. high. The die in which it is made is parted on the longitudinal centre-line of the rectangular opening. Three cores, disposed at 90 deg., are employed for the cavity which forms part of the motor enclosure, the rectangular opening, and the worm gear housing, and are operated by means of cam pins. The thread in the aperture on the side of the worm gear housing is cut in the casting, and eventually receives a plastics moulded plug, which can be removed for greasing the worm gear and reciprocating mechanism. Opposite the aperture, there is a heavy boss which provides the bearing for the worm wheel shaft, and this boss is bored and machined on both sides. In the die, the cavity is arranged so that the face surrounding the rectangular opening is upwards, and the casting is gated along the rounded lower side of the worm gear housing, with an auxiliary bar leading to the lower side of the motor housing portion.

The larger casting, at the left in Fig. 2, which forms the remainder of the motor housing, is also of

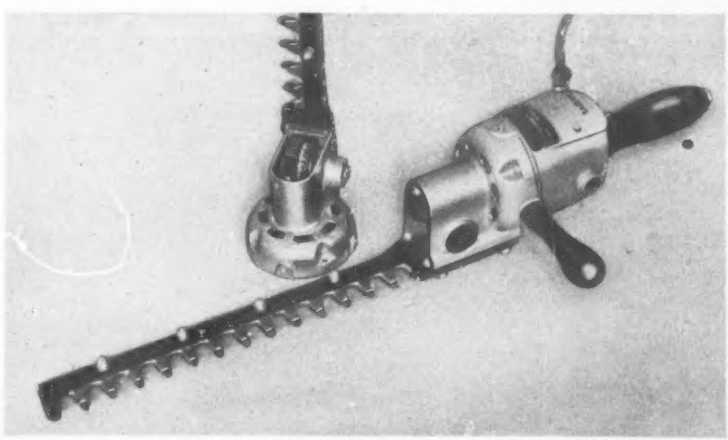


Fig. 1. A Sub-assembly Incorporating the Fixed and Reciprocating Blades, and a Completed Hedge Trimmer Made by Tarpen Engineering Co., Ltd., for which Aluminium Alloy Die Castings are Employed

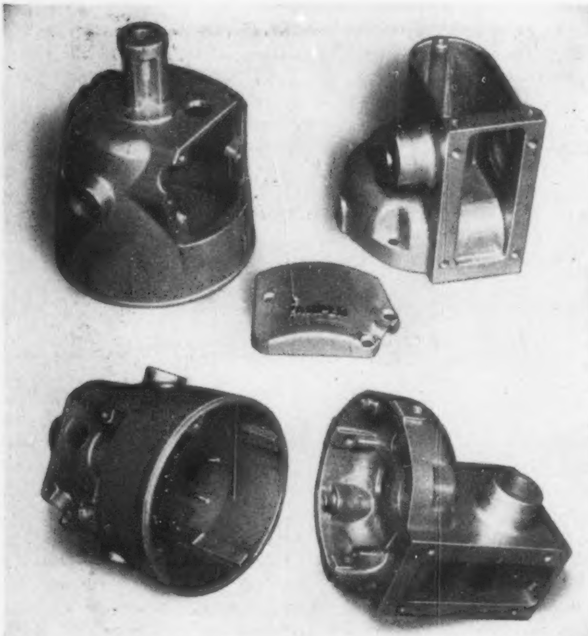


Fig. 2. Views of the Three Castings Employed in the Tarpen Hedge Trimmer, which Include a Motor Housing and a Worm Drive Gear Box. The Castings are made in L.M.6 Alloy on Reed-Prentice 1½ G Machines

nearly 4 in. diameter, and is 4½ in. high to the top of the handle attachment boss. This casting is produced in the die shown in Fig. 3, where the moving half is on the left, and the parting line passes through the brush-holder bosses at each side. Cam pin-operated slides are employed to core these bosses, and a further slide *A* carries a core for a hole in the handle attachment boss, which is later tapped to receive a screw whereby the handle is retained in position. The interior of the motor housing has a number of projections, including bosses for the spindle bearing and the brush-holder apertures. These projections are formed in the large core for the interior of the housing, which is seen, in the retracted position, on the moving die member, at the right in Fig. 3.

A horizontal section through the die is shown in Fig. 4, where the core pin for the handle-attachment boss is again indicated at *A*. The main core for the interior of the casting is operated by the finger cam *B*, which passes through a rectangular aperture in the core. As the die is closed, the end of the cam *B* is engaged by an aperture in a plate *C*, secured to the side of the moving die member, which provides support to prevent deflection in the final closing and initial opening movements. The central boss within the casting, for the bearing of the motor spindle, is cored by a pin *D*, which is enclosed within the main core, and the cam *B* passes through a slot in the outer end of the slide for this pin. On the outer side of the cam slot, there is a steel roller *E*, and when the die is opened, the initial movement causes a portion of the cam with a 15-deg. rise to come into contact with this

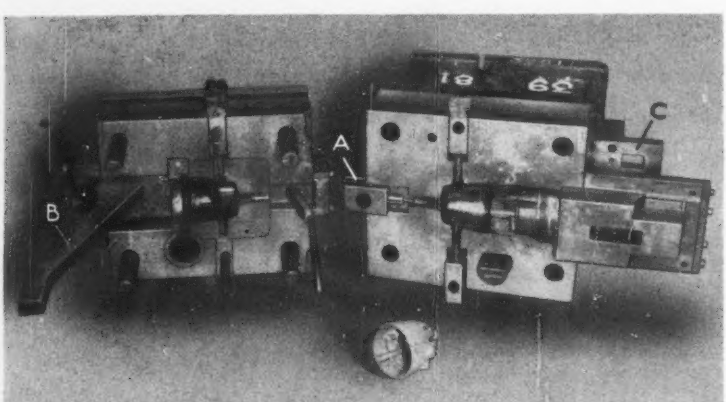
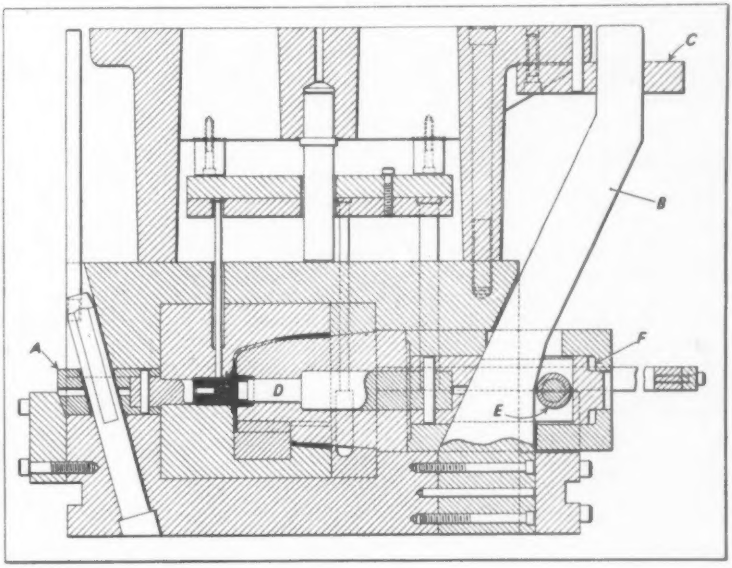


Fig. 3. A View of the Die Employed for the Motor Housing of the Tarpen Hedge Trimmer, Showing the Finger Cam *B* which Operates the Main Core

Fig. 4. A Horizontal Section of the Die Employed for the Motor Housing Casting



roller, to withdraw the pin core from the boss while the latter is still supported by the main core.

After the pin core has been moved outwards for about ¼ in., the end of its slide comes into contact with an internal surface *F*, inside the main core, so that the latter is also moved outwards and freed from the casting. As soon as these movements have been completed, the roller comes into contact with a portion of the finger cam which is at an angle of 25 deg. to the direction of die movement and the cores are then withdrawn clear of the casting in readiness for ejection. During the subsequent die-closing movement, both the main core and the separate pin core are advanced simultaneously by the finger cam *B*, which is machined at an angle of 25 deg. to the direction of die movement, and the main core is finally locked in position by angular surfaces on back-up blocks attached to the side of the fixed die member.

In addition to the internal bosses and projections formed within the casting by this moving core, five ventilation slots for the motor, each about ¼ in. wide, are produced by projections on the core which make contact with the inside of the cavity in the moving die member. The casting is gated from a runner of semi-circular section, which extends round half the periphery of the main core.

Both the castings discussed are produced in L.M.6 aluminium alloy, which provides a pleasing colour tone for those units which are sold in the unpainted condition, and the dies are operated on Reed-Prentice (Alfred Herbert, Ltd.) 1½ G. cold chamber machines.

Euco Safety Collar

When a milling cutter which is not keyed to the machine arbor becomes jammed in a heavy cut, the spacing collars and arbor nut may also momentarily cease to rotate. As a result, the nut may be tightened excessively and removal may then be difficult.

To obviate this trouble, Euco Tools, Ltd., 44 London Road, Kingston, Surrey, have introduced the new safety collar shown in the figure. This collar incorporates a fixed key for engagement with an arbor keyway, and is mounted between the milling cutter and the arbor nut. With this arrangement, if jamming should occur, the collar —and consequently the nut—continues to rotate with the arbor, and further tightening is prevented.

Available with bores of 1, 1¼, and 1½ in., for use on standard milling machine arbors, the collar is particularly intended for use with the Euco hydraulic arbor nut, which was described in MACHINERY, 91/1334—6/12/57.

Euco Safety Collar for Arbors of Horizontal Milling Machines

News of the Industry

Manchester and District

George Richards & Co., Ltd., Broadheath, are fully employed on orders for their standard ranges of vertical boring and turning mills and horizontal boring machines. The former range in capacity from 4 to 18 ft. diameter, and a 16-ft. machine, recently supplied to one of the leading electrical engineering firms, is extendable to admit work up to 25 ft. diameter. Other machines in progress are being fitted with electronic contouring equipment to which we hope to make further reference at a later date. Horizontal boring machines range from No. 1 to No. 6 size and include both travelling and non-travelling spindle types. There is a preponderance of the larger sizes, including machines with widened beds and tables of large capacity.

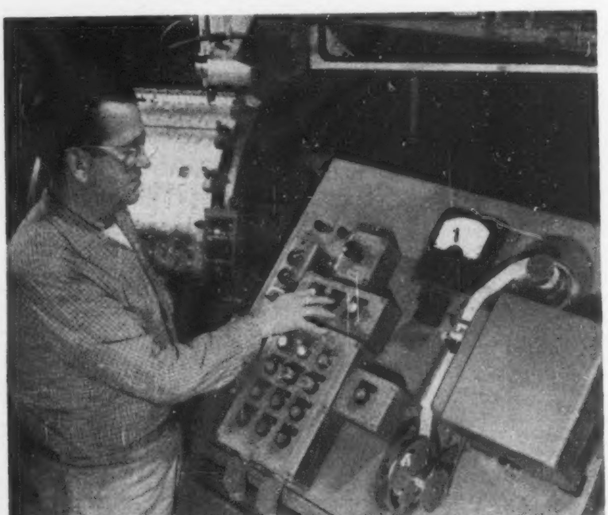
Other work includes planing machines for admitting components from 10 to 14 ft. wide, the largest having a 32-ft. long stroke and a height capacity of 10 ft. 6 in. We hope shortly to describe a 30- by 16- by 13-ft. machine which has recently been completed. Vertical spindle, horizontal keyseating machines of various sizes, and stationary-type crank-pin turning machines are also in hand. On export account we may note recent orders from India, Australia, the Crown Agents for the Colonies, Italy, and Spain.

Tilghman's, Ltd., Broadheath, are well placed for orders for all types of equipment for cleaning castings and forgings, including rotary-table and conveyor-type airless Wheelabrators of various sizes, Tumblasts, and shot-blast plants. We hope shortly to describe a plant which has been developed for cleaning ships' plates to meet the requirements of the oil tanker companies. We may also note that equipment has been supplied to atomic energy establishments. On the air compressor side, orders are in hand for standard types of various capacities, as well as for Uniblok, Twinblok, and Comoblok machines.

Clare-Collets, Ltd., Broadheath, report a steady demand for their full range of patent milling chucks and equipment, in addition to both standard and special milling cutters, routing cutters and end mills. Our attention was drawn to some interesting cutter development work in progress. Recent additions to the plant include another Jones-Shipman tool and cutter grinding machine, and a Precimax plain cylindrical grinding machine.

The Churchill Machine Tool Co., Ltd., Broadheath, have a good order book for their various types and sizes of precision grinding machines from customers both at home and abroad. Work in progress includes plain cylindrical grinders in a wide range of sizes, as well as universal, internal and centreless types for bar grinding. We may also note vertical-

At the works of the General Electric Co. at Everett, Mass., U.S.A., a tape-controlled spot welding machine designed by the company's Small Aircraft Engine Department has been installed. With this equipment, which is shown in the accompanying illustration, the time required for welding cylindrical parts has been reduced to about one-quarter of that needed for manual operations. In one instance, 1,600 spot welds are completed on an assembly in less than 1½ hours



and horizontal-spindle surface grinding machines, piston-ring type rotary machines, openside slideway grinders, and broach and spline grinding machines. Our attention was drawn to some heavy-duty roll grinding machines in course of production.

A description of the firm's latest type NB horizontal spindle surface grinding machine will be included in MACHINERY shortly. It has a worktable capacity of 18 by 6 in., and is intended for use in the toolroom, and for general-purpose work, also in the production line, where the parts can be loaded in quantities on the table or on a magnetic chuck. The grinding wheel is of 8 in. diameter by ¾ in. wide, and the maximum height admitted between the table and a new grinding wheel is 9 in. The table has a power longitudinal traverse of 20 in., and a cross traverse of 7 in., and the hydraulic traverse speeds are steplessly-variable up to 60 ft. per min. Fine hand feeds are provided to the wheel vertically, and to the table transversely.

H. W. KEARNS & CO., LTD., Broadheath, are busy on home and export orders for horizontal boring machines, which include No. 0 to No. 5 sizes, also Optimetric and S-type machines. Widened beds and extended tables are being provided on some of the machines, and attention may be drawn to plano-table type machines fitted with the British Thomson-Houston electronic co-ordinate setting system. A new design of No. 0 plain horizontal borer has recently been introduced. Among new machine tools lately installed are two Asquith 6-ft. O.D.1 radial drilling machines, a Jones-Shipman surface grinder, a Swift-Sommerskill 72- by 30- by 24-in. planer, and a L o s e n h a u s enwerke balancing machine.

THOMAS ROBINSON & SON, LTD., Rochdale, have recently developed a combined roll grinding and fluting machine to which we hope to make further reference shortly. It accommodates rolls up to 60 in. long and 24 in. diameter, and auxiliary equipment, which includes a special driving unit, can be supplied, for grinding operations only, on rolls up to 32 in. diameter. Rolls can be both ground and fluted *in situ,* the change from grinding to fluting being quickly effected. The grinding wheel is mounted on a hardened and ground steel spindle, running in self-lubricating adjustable gunmetal bearings, the drive being taken by V-belts from a 7½-h.p. motor mounted on slide rails. Fluting tools are carried in two precision-built toolboxes, mounted at the rear of the grinding wheel, which are provided with fine feed screws and graduated collars.

MATTERSON, LTD., Shawclough, Rochdale, have recently supplied information on their new size 101 hoist, and we hope shortly to describe a conventional push-travelling trolley-mounted type, and a low headroom type, each of 1 ton capacity. Of robust construction, the hoist components have a minimum factor of safety of 5. Drive is taken from a 1½-h.p., totally-enclosed, squirrel-cage, high-torque, ball-bearing-mounted motor, designed to fit inside the hoist barrel and supported at both ends, and the shaft is extended in both directions to carry the motor pinion and the brake drum.

J. HALDEN & CO., LTD., Rowsley Works, Red-

One of the machine lines in the transmission shop at the works of A-B. Scania-Vabis, Södertälje, Sweden. Typical transmission housings for large vehicles are seen on the conveyor. The company employs approximately 2,800 people, and produces more than 4,000 diesel-engined vehicles, and 1,000 stationary diesel engines, annually

dish, Stockport, have recently introduced the Uni-Ref combined drawing and reference table, which is claimed to offer particular advantages in small drawing offices, where space is an important factor. The reference table is accessible from the back or sides, and the drawing board is carried on an adjustable bench stand mounted on the top of the table, or fitted to a metal pedestal which can be pushed up to the table. We hope to describe this equipment more fully in due course.

RENOLD CHAINS, LTD., Wythenshawe, Manchester, have recently issued a 12-page brochure illustrating and describing the application of Renold chains in machinery for road and building work, such as excavators, rock drills, timber haulers, dumpers, mobile cranes, portable winches, trench diggers, bulldozers, stone-crushing plant, diaphragm pumps, concrete block making machines, motor graders, road finishing machines, road rollers, concrete mixers, tar spreaders, gravel and sand washing machines, mobile asphalt plants, and elevators. H. B.

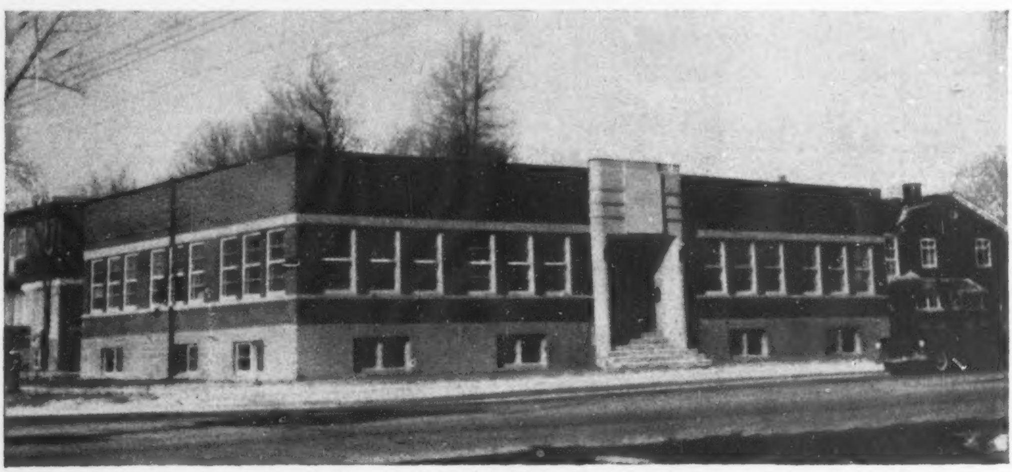
Calver Canadian Branch Company

The machine tool and tool-making firm of C. M. G. Calver, Ltd., Bushey, Herts, have established a Canadian branch company under the same name at 999 de Salaberry Avenue, Montreal, P.Q., with the object of making first-hand contacts in this important market. A view of the factory that has been leased is given in the illustration.

At present the Canadian company is primarily concerned with selling and service, and the products that are being handled include the well-established Calver range of machine shop equipment, comprising Revlac indexing tables and collet-chuck fixtures of patented design, horizontal indexing heads and tailstocks, precision toolpost grinders, toomakers' vices, and a heavy-duty machine vice. In addition, small tools and measuring equipment, including air gauges, by several well-known British makers are stocked. The British company is also producing, for sale in the Canadian market, a range of precision-machined cast-iron sections.

A small universal grinder is being developed for sale both here and in Canada which is so designed that external, internal, and surface grinding operations can readily be performed without the need for additional equipment. The table traverse motion is applied by hand, and steplessly-variable speeds up to 1,000 r.p.m. are provided for the work-head, and from 6,600 to 38,000 r.p.m. for the wheelhead, by electrical control of the D.C. driving motors.

The new company has been appointed sole agent in Canada for the range of Union horizontal boring machines built in East Germany. It will also be concerned with the sale and application of the precision contour plotting and scribing machine developed by Rolls-Royce, Ltd., for producing master charts on emulsion coated glass plates which can be reproduced photographically any number of times. The technique was fully described in MACHINERY, 86/1306—10/6/55, and C. M. G. Calver, Ltd., hold a world licence for building the machine, also for certain other Rolls-Royce developments in this field.



View of the Canadian Factory Recently Established by C.M.G. Calver, Ltd., in Montreal

New Sykes Inspection Department

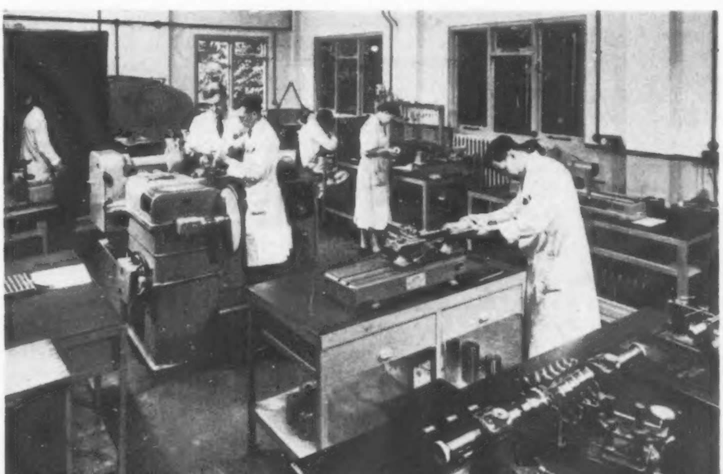
In the accompanying figure is shown a section of the new hob inspection department which has been opened recently at the Manor Works factory of W. E. Sykes, Ltd., Staines, Middlesex. In this department, various machines have been installed to enable hobs to be inspected and measured by the latest techniques including a profile projector; a lead checking machine, equipped with an electronic recording system; a thread pitch-measuring machine; a flank angle testing machine; and a flute division checking machine; also, a floating-carriage type micrometer and a Vickers hardness tester.

Prominent in this new department is the latest Klingelnberg type PWF 250 hob testing machine, which is equipped with automatic electronic recording equipment and is capable of measuring, to a high degree of accuracy, the basic elements of the hob. In addition, with this machine, a direct measurement can be made of the cumulative errors.

A description of this hob testing machine was published in MACHINERY, 89/1140—16/11/56, but reference may be made here to the method whereby the measurement of cumulative errors is achieved. For this operation, a straight blade-type stylus, of a shape which represents the generatrix of the hob form, is employed to trace the periphery of the cutting edges whilst basically following the nominal lead of the hob helix. Any deviation of the cutting edges from their theoretically-correct positions is detected by the stylus blade, and automatically recorded, for each individual tooth.

As a result, a chart is produced which shows the cumulative errors of contact and pressure angles on all the teeth, over the developed length of the spiral, also the effects of the pitch, lead, and concentricity errors. The trace is burnt on to the chart, which is of metallized paper, by means of a high-voltage pen, and the drive to the chart is synchronized with the mechanism which provides for increasing the rate of table travel between adjacent teeth.

The sole agents for Klingelnberg machines in this country are Sykes Machine Tool Co., Ltd., The Hythe, Staines, Middlesex, an associate company of W. E. Sykes, Ltd.



A section of the new hob inspection department recently opened at the Manor Works of W. E. Sykes, Ltd.

Trade Publications

HENRY BEAKBANE (FORTOX), LTD., The Tannery, Stourport-on-Severn, Worcs. Informative booklet entitled "the design and use of corrugated covers." Sections are devoted, for example, to bellows construction, end fixings, supports, ventilation, extension cords, and split covers.

BROOKS & WALKER, LTD., 47 Great Eastern Street, London, E.C.2. Catalogue describing the Diprofil multi-purpose hand filing machine, which may also be used for such operations as lapping, scraping, grinding, honing, polishing, milling, engraving, and sawing. The unit is driven by means of a flexible shaft and an electric motor, and weighs only 1 lb. Details are included of the wide range of rotating- and reciprocating-type tools which are available.

METROPOLITAN - VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, 17. Catalogue entitled Electric Motors and Associated Equipment for the Oil and Chemical Industries, which describes the wide variety of products made by the company for such applications and gives detailed information to facilitate the selection of the correct equipment for a specific purpose. This publication, which is divided into three main sections, namely flameproof equipment, general information, and non-flameproof equipment, has numerous illustrations and extends to 220 pages.

Industrial Notes

Fisher Deane Engineering Co., Ltd., have moved to 19 Howard Close, Hampton, Middlesex (telephone number, Molesey 2612).

South London Screw Co., Ltd.—The address of this company is now Nelson Works, Nelson Road, Sidcup, Kent (telephone number, Foots Cray 3022/3).

Cawkell Research & Electronics, Ltd., have occupied new premises at Scotts Road, Southall, Middlesex (telephone number, Southall 3702 & 5881).

Climax Molybdenum Company of Europe, Ltd. From September 1, the address of this company will be 2 Cavendish Place, London, W.1 (telephone number, Museum 8818).

Stein Atkinson Vickers Hydraulics, Ltd., inform us that their address, from August 30, will be 197 Knightsbridge, London, S.W.7 (telephone number, Knightsbridge 9641).

British Furnaces, Ltd.—The London address of this company is now 26 Westminster Palace Gardens, Artillery Row, Westminster, S.W.1. The telephone number (Abbey 1096) has not been changed.

Brook Motors, Ltd., Empress Works, Huddersfield, have recently occupied larger and more convenient London, offices in a new building at 1-2 Finsbury Square, E.C.2 (telephone number, Metropolitan 9401/7).

The 43rd International Motor Exhibition will be held at Earls Court from October 22 to November 1, and will be officially opened by the Home Secretary, The Rt. Hon. R. A. Butler, M.P.

Steel Production in July averaged 315,900 tons a week, compared with 362,500 tons a year earlier, and pig iron output fell to a weekly average rate of 227,000 tons, as against 263,400 tons in July, 1957, according to figures recently issued by the Iron and Steel Board.

Dean, Smith & Grace, Ltd., Keighley, Yorks., announce that, from September 1, they will be represented in Scotland by Craven Brothers (Manchester), Ltd., 157 West George Street, Glasgow, C.2. All sales and after sales service in Scotland will be handled by representatives operating from that address.

Northampton College of Advanced Technology, St. John Street, London, E.C.1, have issued the prospectus for their part-time day and evening courses for the session 1958/1959. The enrolment dates for students who were in attendance in 1957/8 are September 22 and 23, and for new students, September 23 only.

Machine Tool Orders during May were valued at £5,321,000, including £1,131,000 for export. Deliveries during the month totalled £6,576,000, of which £1,650,000 was for export. Orders in hand at the end of May amounted to £67,105,000, and of this total, £16,967,000 was for export.

The Combustion Engineering Association, 6 Duke Street, St. James's, London, S.W.1, are to hold a 2-day conference on November 11 and 12 at the Royal Hotel, Scarborough. The findings of the National Industrial Fuel Efficiency Service's report on the use of fuel in industry will be discussed, with emphasis on the means by which the greatest economies can most easily be made.

William Asquith, Ltd., High Road Well Works, Halifax, are to extend two of their main machine shop bays by 360 ft. Each of the extensions will be 80 ft. wide, and they will be 46 and 36 ft. high. At the works of the associated Modern Foundries, Ltd., a new steel and asbestos storage hangar is being erected and a new fettling shop is being built which will incorporate a Hydroblast section.

The Industrial Welfare Society, Robert Hyde House, 48 Bryanston Square, London, W.1, are to organize a training course for foremen and forewomen to be held at the above address between September 15 and 19. Entitled "Developing Foremanship Skills in Handling People," the course will be concerned with discipline, understanding resistance to change, delegation of responsibility, training, and report writing, for example.

Stanhope Machine Tools, Ltd., 202 Acton Lane, Harlesden, London, N.W.10, inform us that the following companies, whose products they handle in this country, will be participating in the Mecanelec Exhibition, which is to be held in Paris from September 12 to 21: Ateliers GSP; C. Gambin & Cie; Rouchaud & Lamassiaude; Poinconneuses Cisailles Vernet; and A. Huard. Representatives of the Stanhope company will be present.

The British Motor Corporation announce that during the financial year ended July 31, 504,712 vehicles of all types were produced and sold. This figure, which represents an increase of 65,000 on the Corporation's previous best total (for 1956-57), is stated to be the largest ever achieved by any British or European manufacturer in a 12-month period. The number of vehicles exported was greater by 16 per cent than the figure for the previous year.

Benton & Stone, Ltd., Aston Brook Street, Birmingham, 6, are arranging an exhibition of their products at which a colour film entitled "Air Controlled," will be shown. The exhibition will be held at the St. Enoch Hotel, Glasgow, C.1, on September 9, and at the North British Hotel, Edinburgh, on September 11. Admission will be free, and applications for tickets should be sent to the company at the above address, or to their Scottish representative, Mr. G. Caplan, 27 Boliver Terrace, Glasgow, S.2.

The British Transport Commission have placed orders with the North British Locomotive Co., Ltd., Springburn, Glasgow, for 33 main-line diesel-hydraulic locomotives, of 2,000 h.p., and a maximum speed of 90 m.p.h., and 20 diesel-electric locomotives, of 1,100 h.p. and a maximum speed of 75 m.p.h. In addition, orders have been placed with the English Electric Co., Ltd., Bradford, for 30 diesel-electric locomotives, of 2,000 h.p. and a maximum speed of 90 m.p.h.

BUCK & HICKMAN, LTD., whose head office is at 2-8 Whitechapel Road, London, E.1, have acquired premises at 12, 13 and 14 Victoria Road, St. Philips, Bristol, 2, (telephone number, Bristol 79331), which are now being equipped with comprehensive stocks of all types of engineers' tools. It is hoped that this new branch will be in full operation by the end of the first week in September. Mr. R. Brookes has been transferred from Alperton and appointed manager of the branch.

THE GUEST KEEN AND NETTLEFOLDS GROUP OF COMPANIES has set up a central advisory service to enable full advantage to be taken of the opportunities offered by the European Free Trade Area for British iron, steel and engineering exports. The service will also assist companies in the Group to solve some of the problems of increased foreign competition. Known as the G.K.N. Group Export Services Organisation (G.E.S.O.), it will operate from Shell Mex House, Strand, London, W.C.2.

DOWDING & DOLL, LTD., 346 Kensington High Street, London, W.14, who are sole distributors in the United Kingdom for the range of machines built by L. Kellenberger & Co., are to hold a series of demonstrations of the Kellenberger type 60 K jig fine borer in their showrooms at the above address, from September 8 to 13, inclusive. The demonstrations will take place between 9.30 a.m. and 6 p.m. daily, and technical representatives of L. Kellenberger & Co. will be in attendance.

JAMES NEILL & CO. (SHEFFIELD), LTD., Napier Street, Sheffield, manufacturers of the Eclipse range of magnetic tools, have recently developed a magnetic door catch. Made in two sizes, designated types 870 and 871, these catches have many different applications, and are suitable for example, for use with tool lockers, and workshop cupboards. A powerful permanent magnet, flexibly mounted in a silver anodized aluminium housing, is employed in conjunction with a drilled striker plate. The catches are made in two sizes.

THE OWEN ORGANISATION, P.O. Box 323, Kent House, Market Place, Oxford Circus, London, W.1, have acquired the business of Mechanair, formerly carried on by Acocks Engineering Co., Ltd. Mechanair are manufacturers of air compressors and installations, pressure vessels, de-icing equipment for aircraft, weld-fabricated structures, and test rigs, the production of which, in future, will be carried out at Darlaston. Mr. J. E. Kavanagh, formerly managing director of Acocks Engineering Co., Ltd., will be in charge of the Mechanair division of Rubery, Owen & Co., Ltd.

ENGINEERING PRODUCTS, LTD., Glenbrook Works, Littler's Close, Colliers Wood, Merton Abbey, London, S.W.19, have, for some time, had an arrangement with some of their larger customers whereby old and worn dial gauges are replaced with a fixed allowance of 10s. 0d. per gauge. This scheme is now being extended to cover any firm in the British Isles. Old dial gauges may be returned to the usual merchants or, in case of difficulty, directly to Engineering Products, and new replacements of the type required will be promptly despatched.

BRITISH TRACTOR EXPORTS.—Britain exported almost 50 per cent more tractors than the combined totals of the two major competitors—Germany and America—during 1957, according to a report issued by the Agricultural Engineers Association, Ltd. German exports numbered 38,000, American, 40,000, and British, 115,000. In the first four months of this year, German tractor sales in Europe fell by 11 per cent, while British sales rose by more than 10 per cent, and recent figures indicate that this trend is continuing.

THE RESEARCH ASSOCIATION OF BRITISH RUBBER MANUFACTURERS, Shawbury, Shrewsbury, has arranged a 3-day course, to be held on October 8 to 10, concerned with "Dynamic Design with Rubber." The course will be held at the Shropshire Adult College, Attingham Park, Atcham, near Shrewsbury, and the lectures should be of particular interest to those concerned with the application of rubber in the engineering industry. A visit to the Association's Laboratories at Shawbury will be arranged. Application forms can be obtained from the Association's secretary, at the above address.

RECORD AIRCRAFT EXPORTS.—The Society of British Aircraft Constructors recently announced that overseas sales by the aircraft industry during the first six months of 1958 constituted a record. Exports during the period were valued at £77,208,814, an increase of 46 per cent compared with the total for the first half of last year. Corresponding figures for 1956, 1955 and 1954 were £55,900,000, £30,700,000 and £29,700,000. The leading buyers of aircraft and parts during June were India (£2,007,759), Canada (£1,525,865), West Germany (£1,211,722), and the U.S.A. (£1,122,073).

Annealing Low Carbon Steel

A book consisting of papers selected from those delivered at the first International Symposium on the Annealing of Low Carbon Steel, which was held at the Case Institute of Technology, Cleveland, Ohio, in October, 1957, has recently been published, and is available from the American Society for Metals, Technical and Engineering Book Service, 7301 Euclid Avenue, Cleveland, 3, Ohio, U.S.A. (price $7·50).

The symposium, at which 207 papers from 12 different countries were presented, was concerned with the latest techniques and research, also the economics, of annealing low carbon steel, and among the contributions included in this book may be noted those from the Steel Company of Wales; the Bethlehem Steel Co.; the Department of Metallurgical Furnaces, the Steel Institute, Moscow; and the Steel Company of Canada, Ltd.

The papers are illustrated by tables and photographs, and in addition to a report on the discussions which took place, the book includes a summary of the proceedings, by the chairman of the Incandescent Group of Companies, Smethwick.

Personal

MR. D. E. JONES and MR. A. E. MITCHELL have been appointed export manager and deputy sales manager, respectively, of Alfred Imhof, Ltd., 112/116 New Oxford Street, London, W.C.1.

MR. JOHN GOODE has joined G. A. Engineering Services, Ltd., 2 Bloomfield Road, Bromley, Kent, as general manager. He succeeds Mr. B. H. Gregory, who has resigned to take up a teaching appointment overseas.

MR. L. P. HULIN has been appointed managing director of Payne Products International, Ltd., Lawrence Estate, Green Lane, Hounslow, who handle the production and sales of the Lapmaster range of lapping machines in the European area.

MR. W. J. RAYMONT has been appointed general manager of the Cinetra Manufacturing Co., Ltd., 12 Oval Road, Camden Town, London, N.W.1. He joined the company in 1932, and is a member of the British Kinematograph Society.

MR. STANLEY FIELD has been appointed chairman of the board of Venesta, Ltd., Vintry House, Queen Street Place, London, E.C.4, in succession to Mr. Henry Rutherford, who, after 50 years' service with the company, has relinquished the post owing to ill health.

MR. B. JONES and MR. S. HANSON have been appointed technical representatives for Benton & Stone, Ltd., Aston Brook Street, Birmingham, 6. Mr. Jones will be responsible for Shropshire, Cheshire and parts of Wales and Mr. Hanson for the South-West of England. In addition, each will cover certain postal districts in Birmingham.

MR. DAVID J. I. GRAY, A.M.I.Prod.E., has joined W. E. Norton (Machine Tools), Ltd., Grosvenor Gardens House, Grosvenor Gardens, London, S.W.1, as technical sales manager. Mr. Gray, who has had extensive experience in many branches of engineering, was previously manager of the Compressor Division of Cooper-Stewart Engineering Co., Ltd. He served his apprenticeship with the de Havilland Aircraft Co., Ltd., and subsequently held posts with John Fowler & Co., Ltd., Leeds, and a large engineering firm in New Zealand.

The Extending Field for "Gun Drilling"

(*Continued from page* 455)

determine the practicability of multiple gun-drilling operations on cast iron cylinder heads. At one set-up, it is reported, valve guide holes of 0·3728 in. diameter by $2\frac{7}{16}$ in. long were produced with 2-flute drills at a speed of 2,600 r.p.m. and a feed of 8 in. per min. The diameter was held to -0 $+0·0007$ in. and a surface finish of 50-60 micro-inches was obtained.

It will be evident, therefore, that gun drilling can no longer be regarded as a specialized technique remote from normal shop practice. Even for comparatively short holes, the process may be competitive with alternative methods, particularly where accuracy and surface finish are important.

Correction

In MACHINERY, 93/387—13/8/58, reference was made to a work holding clamp made by Autoset (Production), Ltd., Stour Street, Birmingham, 18, and it was incorrectly stated that the body accommodates a 3-in. bolt. In fact, the bolt size is $\frac{3}{8}$ in., and the clamp has a height range from 0 to $2\frac{1}{4}$ in.

U.S. Machine Tool Exports

The following table gives the quantities and value of exports of various classes of machine tools from U.S.A. during December, 1957.

	Number	Value $
Engine and tool room lathes	44	128,524
Light duty and bench lathes	85	65,556
Turret lathes	21	218,473
Other lathes	60	1,150,179
Vertical boring and turning mills	9	112,308
Boring machines	22	599,912
Tapping and threading machines	141	211,121
Milling machines	144	1,291,504
Gear cutting machines	44	1,057,989
Gear grinding and finishing machines	14	265,873
Drilling machines	214	206,296
Planing, shaping and slotting-machines	23	158,801
Surface grinding machines	23	335,516
Tool and cutter grinding machines	68	225,059
Other grinding machines	28	915,306
Honing and lapping machines	11	97,103
Broaching machines	1	750
Sheet and plate metal-working machines	426	3,537,265
Forging machines and hammers	50	680,958
Metal forming machines	—	634,815
Other machines	1,097	1,252,861

New Morris Motors Plant

A new plant for the manufacture and assembly of rear axle units for B.M.C. cars and commercial vehicles has recently been installed by the Tractor and Transmissions Branch of Morris Motors, Ltd., Birmingham, at a total cost of £1 million. Specialized gear cutting and automatic transfer equipment provides for highly efficient production, and crown wheels and pinions are machined and assembled at the rate of 4 per min.

A uniform colour scheme, of light green, has been adopted for the interior of the building, also for the exteriors of the 400 machines, and a 3-colour code has been employed for the work transfer conveyors to facilitate identification of the various types of vehicle transmissions which are made.

Crown wheels and pinions are processed completely in this plant, through the various stages of blank preparation, normalizing, turning, gear cutting, hardening, and lapping, to assembly in the housing. Finally, the units are run at 3,000 r.p.m. in a soundproof enclosure.

Obituary

Mr. W. N. McCann, manager of the Manchester branch of the Silvertown Rubber Co., Ltd., Herga House, Vincent Square, London, S.W.1, died recently. He had been in the service of the company for 27 years.

Machine Tool Share Market

Stock markets were firm and generally cheerful in active trading during the period under review, and provided many good features.

Outstanding, was the broadening of buying interest, and the steady upward movement in prices of British funds and other high-grade fixed interest stocks.

Bright conditions prevailed in the commercial and industrial sections to the accompaniment of increasing firmness, and many gains were shown on balance.

Among machine tool issues Edgar Allen advanced 1s. to 33s.; John Holroyd "A," 1s. to 11s. 6d.; Kitchen & Wade, 1s. to 9s. 6d.; Samuel Osborn, 1s. to 19s. 3d.; Birmingham Small Arms, 2s. to 32s.; British Oxgen, 2s. to 40s.; Thos. W. Ward, 2s. to 79s.; Broom & Wade, 1½d. to 11s. 7½d.; John Shaw & Sons (Wolverhampton), 1½d. to 12s. 7½d.; Clarkson Engineers, 6d. to 14s.; B. Elliott, 6d. to 3s. 3d.; Ambrose Shardlow, 6d. to 37s. 6d.; Churchill Machine Tool, 1s. 3d. to 19s.; Alfred Herbert, 1s. 3d. to 36s. 3d.; John Holroyd "B," 1s. 3d. to 11s. 6d.; Geo. Cohen, 3d. to 11s. 9d.; and John Harper, 7½d. to 14s. 1½d.

A. A. Jones & Shipman, Ltd.—Interim dividend 5 per cent (same).

COMPANY		Denom.	Middle Price
Akwood Machine Tools, Ltd.	Ord.	1/-	9d.
Armstrongs, Stevens & Son, Ltd.	Ord.	5/-	8/3
Allen (Edgar) & Co., Ltd.	Ord.	£1	33/-
" "	5% Prf.	£1	14/9*
Arnott & Harrison, Ltd.	Ord.	4/-	13/9
Asquith Machine Tools Corp., Ltd.	Ord.	5/-	19/6
" " "	6% Cum. Prf.	£1	18/6
Birmingham Small Arms Co., Ltd.	Ord.	£1	32/-
" " "	5% Cum. "A" Prf.	£1	15/6
" " "	6% Cum. "B" Prf.	£1	17/6
" " "	4% 1st Mort. Deb.	Stk.	87½
British Oxygen Co., Ltd.	Ord.	£1	40/-
" " "	6½% Cum. Prf.	£1	21/6
Brooke Tool Manufacturing Co., Ltd.	Ord.	5/-	4/1½
Broom & Wade, Ltd.	Ord.	5/-	11/7½
" "	6% Cum. Prf.	£1	17/9
Brown (David) Corporation Ltd.	5½% Cum. Prf.	£1	14/-
Buck & Hickman, Ltd.	6% Cum. Prf.	£1	17/9
Butler Machine Tools Co., Ltd.	Ord.	5/-	6/6
" " "	5% Cum. Prf.	£1	13/9
C.V.A. Jigs, Moulds & Tools, Ltd.	5½% Red. Cum. Prf.	£1	13/9
Churchill (Charles) & Co., Ltd.	Ord.	2/-	4/11½
" " "	6% Cum. Prf.	£1	26/3
Churchill Machine Tool Co., Ltd.	Ord.	5/-	19/-
" " "	6% Cum. Prf.	£1	18/6
Clerkson (Engrs.), Ltd.	Ord.	5/-	14/-
Cohen (George), Son & Co., Ltd.	Ord.	5/-	11/9
" " "	4½% Cum. Prf.	£1	14/6
Coventry Gauge & Tool Co., Ltd.	Ord.	10/-	14/1½
" " "	5% Cum. Red. Prf.	£1	16/3
Coventry Machine Tool Works, Ltd.	Ord.	4/-	8/3
Craven Bros. (Manchester), Ltd.	Ord.	5/-	6/7½
Elliott (B.) & Co., Ltd.	Ord.	1/-	3/3
" "	4½% Red. Cum. Prf.	£1	13/9
Export Tool & Case Hardening Co., Ltd.	Ord.	2/-	1/3
Firth Brown Tools, Ltd.	4% Cum. Prf.	£1	12/6
Greenwood & Batley, Ltd.	Ord.	£1	48/1½

COMPANY		Denom.	Middle Price
Harper (John) & Co., Ltd.	Ord.	5/-	14/1½
" "	4½% Red. Cum. Prf.	£1	13/1½
Herbert (Alfred), Ltd.	Ord.	£1	36/3xd
Holroyd (John) & Co., Ltd.	"A" Ord.	5/-	11/6
" "	"B" Ord.	5/-	11/6
Jones (A. A.) & Shipman, Ltd.	Ord.	5/-	21/3
" " "	7% Cum. Prf.	5/-	5/-
Keyser, Ellison & Co., Ltd.	Ord.	£1	45/-
" " "	6% Cum. Prf.	£1	18/3
Kendall & Gent, Ltd.	Ord.	5/-	7/7½
Kerry's (Gt. Britain), Ltd.	Ord.	5/-	6/3
Kitchen & Wade, Ltd.	Ord.	4/-	9/6 ex rights
Martin Bros. (Machinery), Ltd.	Ord.	2/-	2/4½
Massey, B. & S., Ltd.	Ord.	5/-	8/3
Modern Engineering Machine Tools Ltd.	Ord.	5/-	10/7½
Newall Engineering Co., Ltd.	Ord.	2/-	4/9
Newman Industries, Ltd.	Ord.	2/-	2/3
" "	6% Prf. Ord.	5/-	5/6
Noble & Lund, Ltd.	Ord.	2/-	2/9
Osborn (Samuel) & Co., Ltd.	Ord.	5/-	19/3
" " "	5½% Cum. Prf.	£1	25/9
Pratt (F.) & Co., Ltd.	Ord.	5/-	21/3
Scottish Machine Tool Corporation, Ltd.	Ord.	4/-	5/-
Shardlow (Ambrose) & Co., Ltd.	Ord.	£1	37/6
Shaw (John) & Sons, Wolverhampton, Ltd.	Ord.	5/-	12/7½
Sheffield Twist Drill & Steel Co., Ltd.	Ord.	4/-	11/6
" " " "	5% Cum. Prf.	£1	15/-
Stedall & Co., Ltd.	Ord.	5/-	6/3
Tap & Die Corporation, Ltd.	Ord.	5/-	8/-
" " "	4½% Deb. 1961-1977	Stk.	82/-
Wadkin, Ltd.	Ord.	10/-	17/6
Ward (Thos.) W.), Ltd.	Ord.	£1	79/-
" "	5% Cum. 1st Prf.	£1	15/9
" "	5% Cum. 2nd Prf.	£1	24/-
Willson Lathes, Ltd.	Ord.	1/-	2/4½

The Middle Prices given in the list are in several cases nominal prices only and not actual dealing prices. Every effort is made to ensure accuracy, but no liability can be accepted for any error. * Sheffield price. † Birmingham price.

PRICES OF MATERIALS

All prices per ton except where otherwise stated.

Pig-Iron

Foundry and Forge No. 3, Class 2

Middlesbrough zone	£21 6 0
Birmingham	£20 18 3

Phos. 0·1 to 0·75%

Birmingham	£23 17 0

Scottish Foundry

Grangemouth	£25 3 6

Hæmatite

English No. 1

N.E. and N.W. Coast	£25 6 6
Scotland	£25 13 0
Sheffield	£26 15 0
Birmingham	£27 4 0

Welsh

Welsh	£25 6 6

Steel Products

Medium plates	£45 11 6
Mild steel plates, ordinary*	£42 2 0
Boiler plates*	£44 12 0
†Flat bars 5 in. wide and under; †Round bars under 3 in.	£40 0 6
Billets, rolling quality, soft U.T.	£32 15 6

Phosphor Bronze

Ingots (2B8) (A.I.D.) d/d	£255 0 0

Copper

Cash (mean)	£207 12 6
Cold rolled and hot rolled sheets 4 ft. by 2 ft. by 10 SWG	£273 15s. 0—£274 0 0
Rods 5/16 in. to ¾ in. diam.	£292 15 0
Tubes, 1½ in. bore by 10 SWG, ton lots, per lb.	2s. 9¾d.
Wire rod, black, hot-rolled (¼-5/16 in.) English	£223 12 6

Zinc

Refined, minimum 98 per cent. purity, current month (mean)	£62 2 6

Brass

Tubes, solid drawn, per lb.	1s. 7¾d.
Strip 63/37, 6 in. by 10 SWG coils, ton lots	£229 10 0—£232 0 0
Rods, ¼-3in. diam. (59 per cent copper)	1s. 9¾d.

Yellow Metal

Condenser plates, per ton	£166 0 0
Rods, per lb.	1s. 10¾d.

Aluminium

Ingots min. 99·5 per cent Canadian d/d	£180 0 0

Lead

Refined, minimum 99·97 per cent purity, current month (mean)	£67 18 9

Tinplates

‡U.K. Home trade:	
Handmill f.o.t. makers' works	£3 11 8¼
Cold reduced, f.o.t. makers' works	£3 7 4½
U.K. Export:	
Hot rolled basis, f.o.t. works' port	72s. 6d.—75s. 0d.
Cold reduced basis, f.o.t. works' port	75s. 0d.

Gunmetal

Ingots, 85.5.5.5. ex works	£170 0 0

* N.E. Coast, N. Joint Area, Central Scottish Zone.

† U.T. soft basic.

‡ Official maximum price, after allowing for adjustments for increase in price of tin.

MAKERS' PRICES

Hexagon Steel Bars[1]

Sizes in inches from 1 in. up to 2·21 and 2·41 a/f, ex works 2 ton basis	£42 17 0
Free cutting black	£47 6 6

Reeled Steel Bars[1]

Single-reeled 1½ in. upwards, f.o.t. works (+ usual extra for sizes)	£43 9 6
Free cutting	£47 19 0

High-Speed Steel

Black random length bar. All prices basic, per lb., subject to extras.

Molybdenom "66"	5s. 10½d.
Molybdenum "46"	5s. 8½d.
14 per cent tungsten	5s. 9d.
16 per cent tungsten	6s. 1½d.
18 per cent tungsten	6s. 4d.
22 per cent tungsten	7s. 5d.
5 per cent cobalt	9s. 6d.
4·75/5·25 per cent molybdenum + 6·0/6·75 per cent tungsten + 1·75/2·05 per cent vanadium (5-6-2)	6s. 0½d.

Precision-ground, High-speed Free-turning Brass Rod[2]

⅜-in. dia. ± 0·00025-in. 2-ton lots, per lb.	2s. 5¼d.

Grey Iron Rod

Die Cast[3]

Die Cast[3] in random lengths 18 in. to 26 in. rough machined 1/32-in. above listed size. Extra for definite lengths. Discounts for orders over £150.

	Per cwt. net. Mark I	Mark III
¾ or ⅞in.	245s. 4d.	318s. 10d.
1 or 1⅛ in.	196s. 4d.	251s. 10d.
1¼ to 1½ in.	137s. 10d.	171s. 2d.
1⅝ to 2 in.	106s. 2d.	125s. 11d.
2⅛ to 3¼ in.	91s. 6d.	106s. 4d.
3⅜ to 12 in.	86s. 6d.	99s. 2d.

Continuous Cast

10-ft. lengths, centreless machined 1 to 3-in. dia. + 0·010 to 0·020 in., prices as quoted for die cast bar[3]

6-ft. lengths	¾ or ⅞ in.	245s. 4d.
centreless ground	1 or 1⅛ in.	196s. 4d.
+ 0·010 in. Extra		
for hardenable	1¼ to 1½ in.	137s. 10d.
alloy iron[4]	1⅝ to 2 in.	106s. 2d.
Per cwt. net	2⅛ to 3¼ in.	91s. 6d.

Stellite[5]

Welding Rods plain

¼ in. dia. per lb.	30s. 0d.

Toolbits

¼ in. sq. × 4 in., each	22s. 3d.

Precision-ground Mild Steel[2]

1-in. dia. + 0·00025-in. 4-ton lots, per cwt.	121s. 6d.

1 Colvilles, Ltd., Glasgow, and 17 Grosvenor Street, London, W.1. 2 Pratt, Levick & Co., Ltd., Chester. 3 Sheepbridge Alloy Castings, Ltd., Sutton-in-Ashfield. 4 "Flocast," Harold Andrews Sheepbridge, Ltd., Halesowen. 5 Deloro Stellite, Ltd., Highlands Road, Shirley, Solihull.

BASIC PRICES FROM LONDON STOCK[6]

Free Cutting Steel

Bright cold drawn: (Usaspead) over 1½ to 2 in.	£59 17 6
Lead bearing (Usaled)	£64 4 0
Precision ground, 1½ in.	£81 13 6

Bright Drawn

M.S. bars (M.M.C.) over 1½ in. to 2 in.	£55 3 6
Square edge flats (Usaflat)	£72 0 0
M.S. angles (Usaspead)	£99 10 0
Casehardening (EN) (Usacase) over 1½ in. to 2 in.	£63 9 6
M.S. bars (EN3B) (Usamild) over 1½ to 2 in.	£57 3 6
Carbon manganese semi-freecutting case hardening (EN202) (Usaspead 202) over 1½ to 2 in.	£72 19 0
35/45 ton tensile (EN6) (Usen) over 1 to 1½ in.	£64 17 6
0·4 Carbon Normalised (Usaspead "40") over 1½ in. to 2 in.	£66 19 6
Carbon manganese steel to Specification EN.16.T (Usaspead 5565), per ton	£127 11 3

Ground Flat Stock

18-, 24-, and 36-in. lengths (Usaspead). List prices less 5 per cent

Oil Hardening Cast Steel

Non-shrink (Usaspead N.S.O.H.) ⅛ in. to 2½ in., per lb.	1s. 11d.
Non-distorting heavy duty (Usaspead H.C.H.C.) ⅛-in. to 2½-in., per lb.	4s. 2d.

Silver Steel

(0·194-in. to 1½-in.) Genuine Stubs quality, per lb.	4s. 6d. less 27½%
M.M.C. quality, per lb.	2s. 5d. + 6½%
Boxes of 16 assorted sizes 1/16-in. to ⅝-in. dia.	7s. 6d.

Stainless Steel

K.E. 40.AM (Freecutting), per lb.	3s. 3½d.

Glacier Machined Bronze Bars

Phosphor bronze (2B8); Lead bronze	Prices on application

High-speed Steel

18 per cent tungsten. Prices on application.

Toolholder bits: Usaspead "Super", " "Supreme", " Cobalt 10	List price

Shimstock

Steel assorted, per tin	3s. 6d.
Brass " "	7s. 3d.

6 Macready's Metal Co., Ltd., Pentonville Road, N.1. Subject to confirmation by London Office. Delivered free by van in London area.

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- ★ Swivelling and sliding head
- ★ Power feeds in three directions
- ★ Rapid traverses with single lever control
- ★ Centralised grouping of control levers
- ★ Hardened and ground gears
- ★ Schlesinger limits

Table w.s. 63" x 15"
Spindle speeds (20) 30—1,200 rpm.
Power traverses $51\frac{1}{2}$" x $14\frac{1}{2}$" x $21\frac{3}{8}$"
Table feeds (16) .281"—22" per min.
H.P. 17
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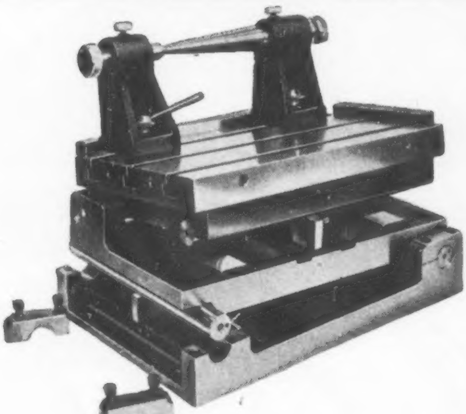

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Base........12in. × $8\frac{1}{4}$in.
Height at rest........5in.
10in. and 5in. Roller Centres.
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Face (T Slotted)........8in. × 5in.
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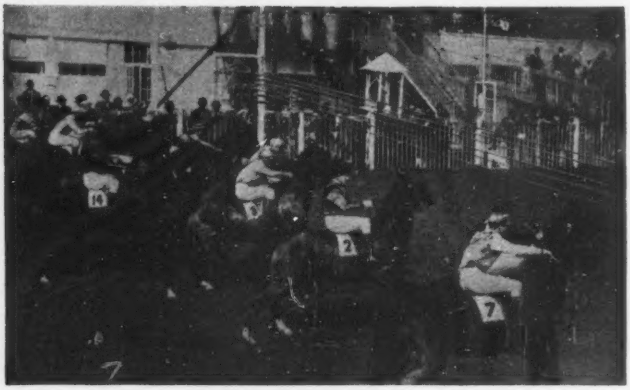

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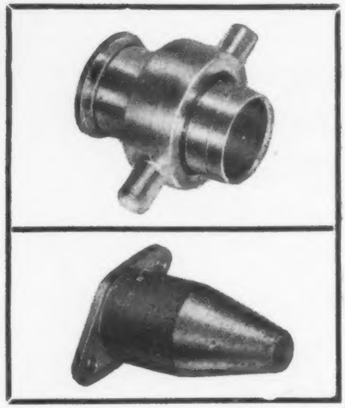

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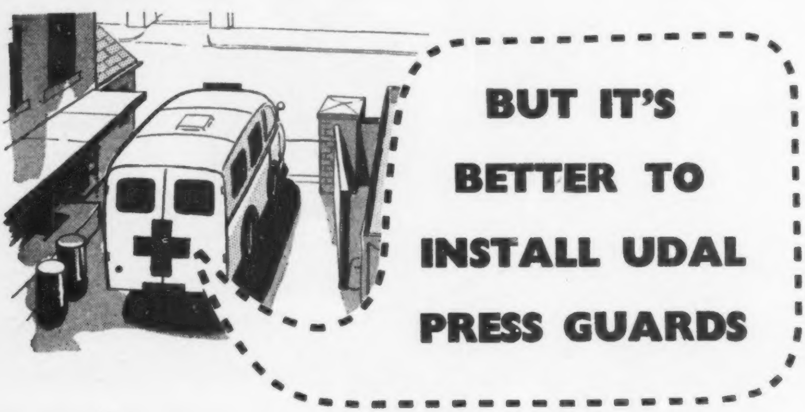

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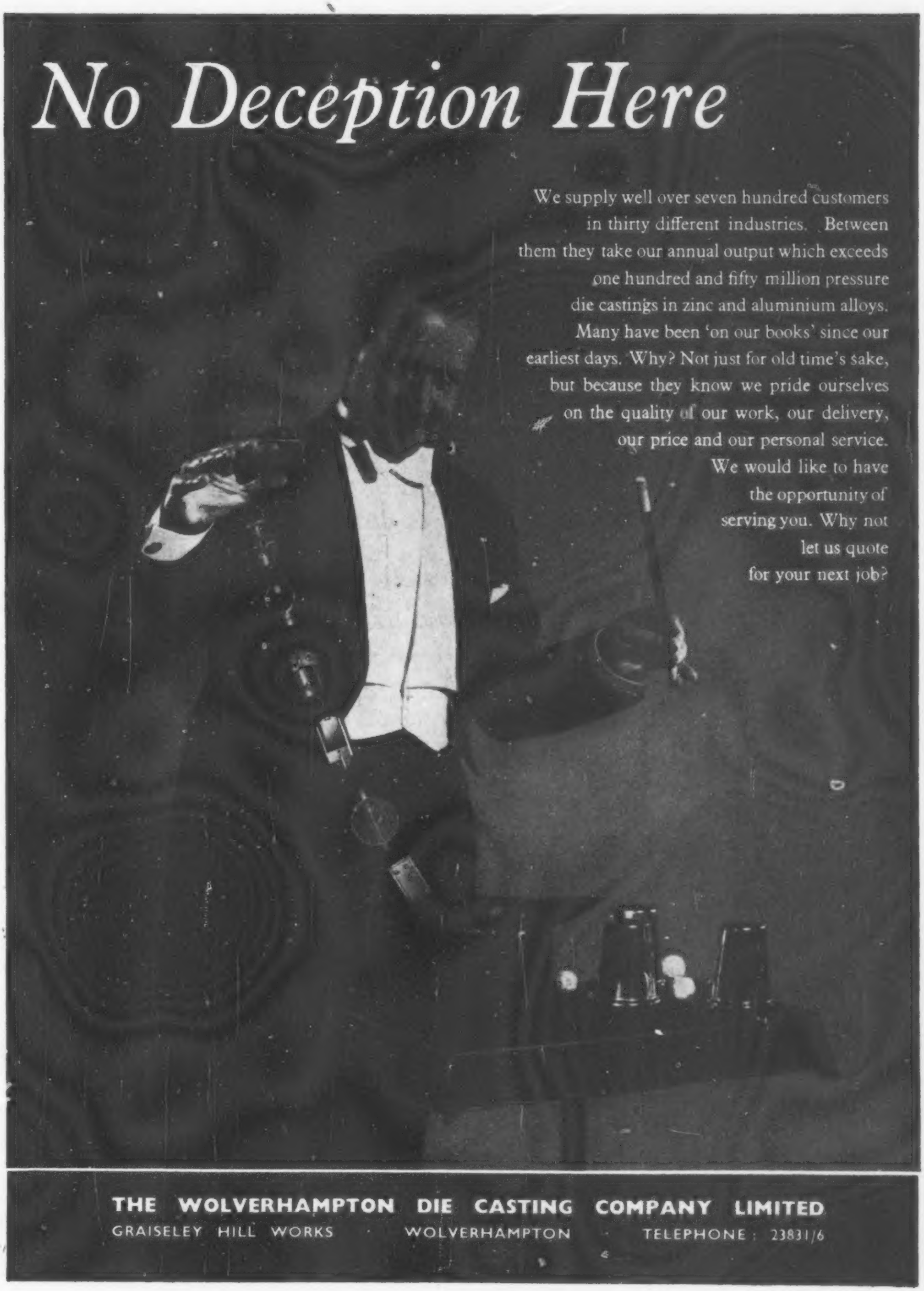
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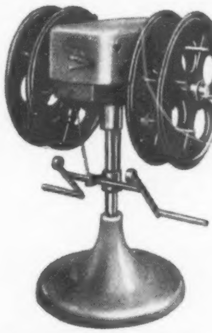
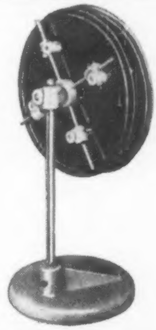


NON-INCLINABLE VERTICAL DOUBLE-SIDED MOTORISED MODEL ML.20.

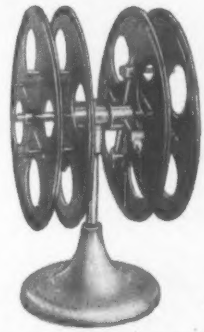
Max. outside coil dia. ...	22in.
Min./Max. inside coil dia.	7/17in.
Maximum width of coil ...	6in.
Max. weight of coil ...	280 lb.
Feed	0-35 ft./min.



NON-INCLINABLE VERTICAL MODEL A18.

Max. outside dia. of coil...	22in.
Min./Max. width of coil...	7/17in.
Max. coil width	6in.
Max. weight of coil ...	3 cwt.

Also available in larger size.



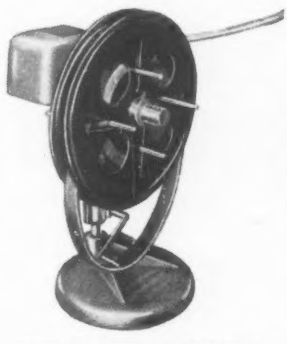
DOUBLE-SIDED VERTICAL MODEL A36.

Max. outside dia. of coil...	22 or 34in.
Min./Max. inside dia. of coil	8/17in.
Max. width of coil ...	6in.
Max. weight of each coil...	4 cwt.

HORIZONTAL AUTOMATIC BRAKING MODEL HB.3

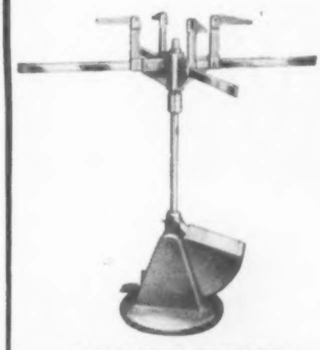
This model is mainly intended for wire coil. The automatic brake effectively prevents over run of stock.

Dia. of platform	36in.
Inside dia. of coil ...	9in.
Max. weight of coil ...	2 cwt.



NON-INCLINABLE VERTICAL SINGLE SIDED MOTORISED MODEL M1.

Max. outside coil dia. ...	22 or 34in.
Min./max. inside coil dia.	7/17in.
Max. width of coil ...	6in.
Max. weight of coil ...	3 cwt.
Feed	0-35 ft./min.



HORIZONTAL COUNTER-BALANCED MODEL HC4.

Max. outside coil dia. ...	30in.
Min./Max. inside coil dia.	12/18in.
Max. weight of coil ...	4 cwt.

Intended for wire coils only, this model is capable of being tilted for ease of loading. Counterbalance weight reduces effort when returning coilholder to operating position.

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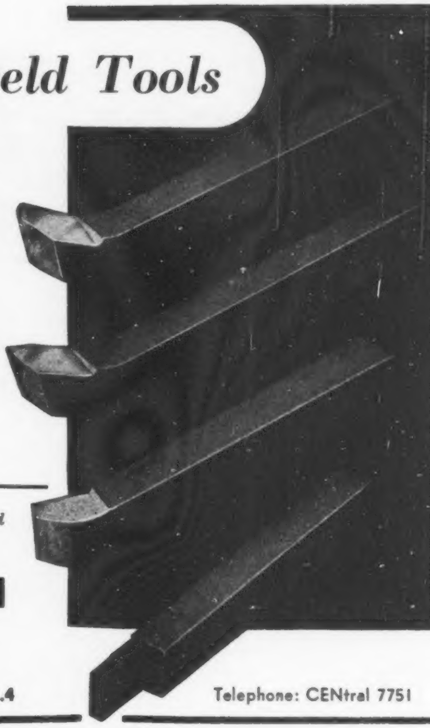

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The solid end of STAG MAJOR SUPERWELD TOOLS is no mere layer, but electrically butt-flash welded Stag Major super high speed steel on medium Carbon Steel Shanks. They give maximum performance with an exceptionally long cutting life.

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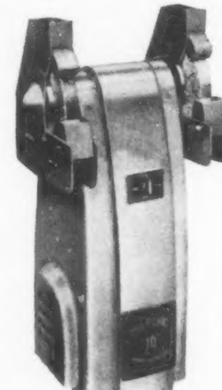

Standard 10" machine

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★ 10", 12" 14" and 16" wheel diameters

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16" machine arranged for wet grinding with tank in base.

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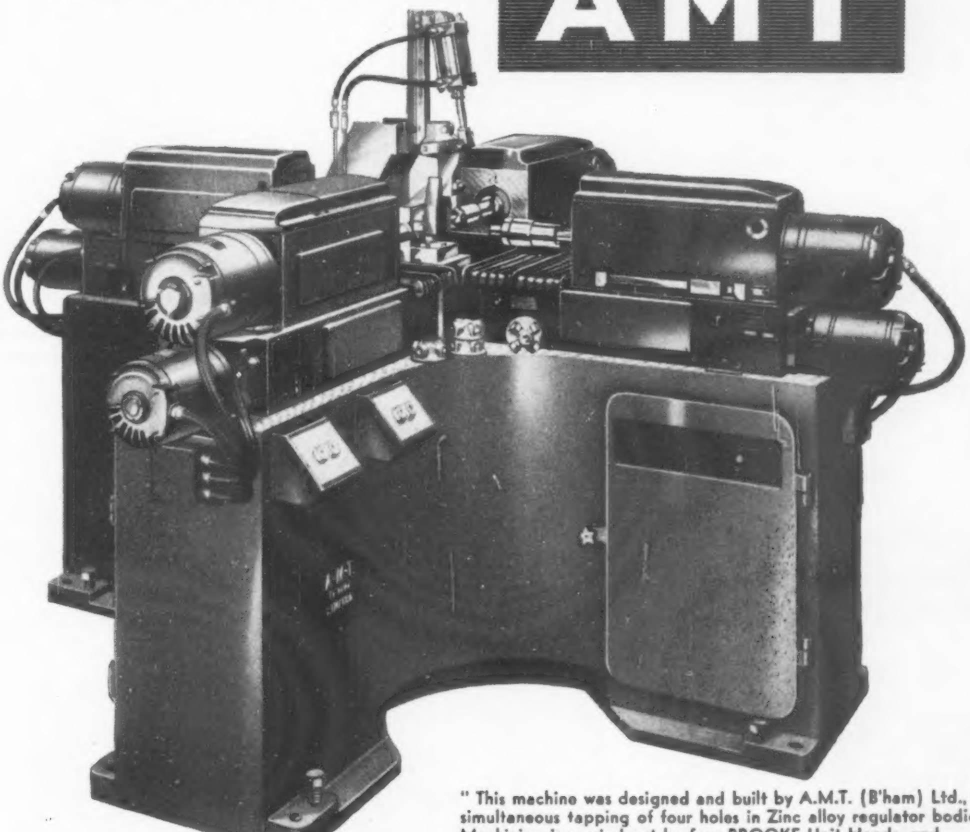

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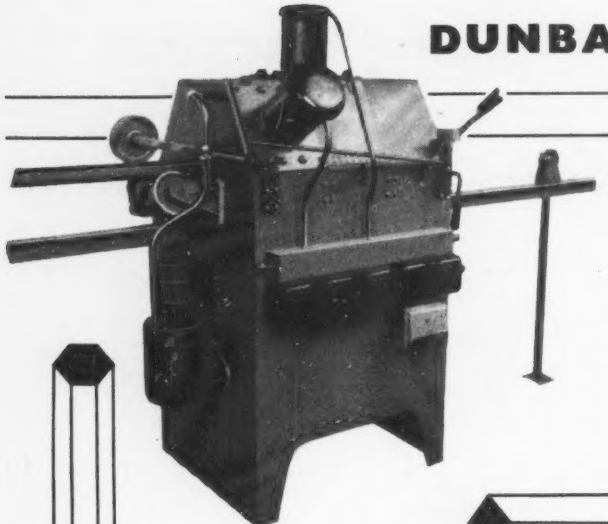

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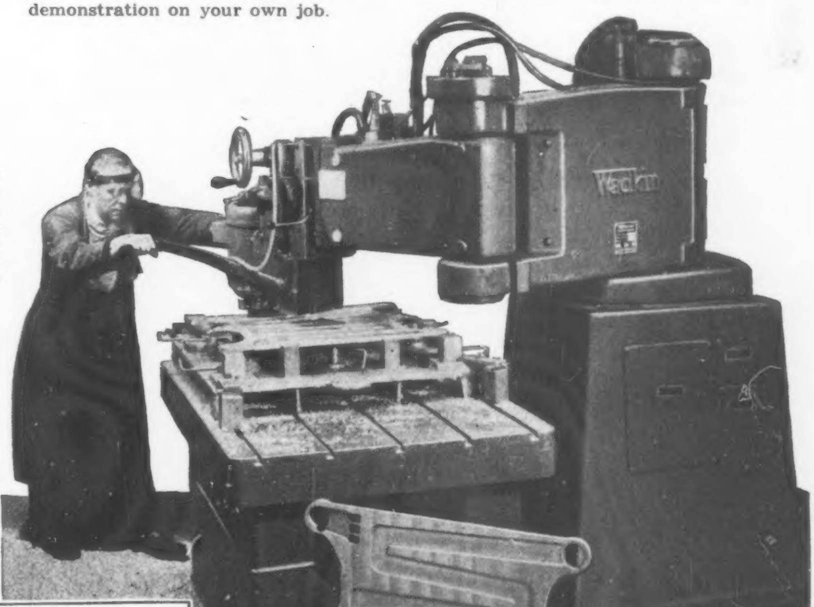
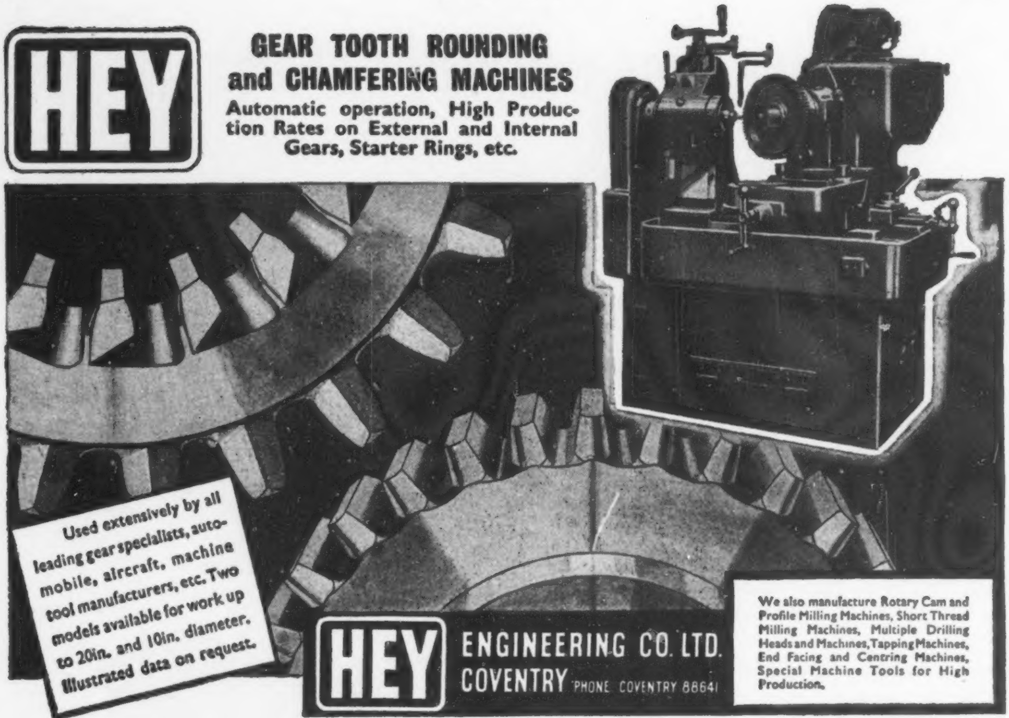


A Wadkin Articulated Arm Router, type L.C. face-milling a filter plate at Brytallium Castings (Bolton) Ltd., Bolton. A finished component is shown in the foreground.

Wadkin

Wadkin Ltd., Green Lane Works, Leicester. Tel.: 68151. London Office: 62 Brook St., W.1. Tel.: MAYfair 7048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Automatic operation, High Production Rates on External and Internal Gears, Starter Rings, etc.
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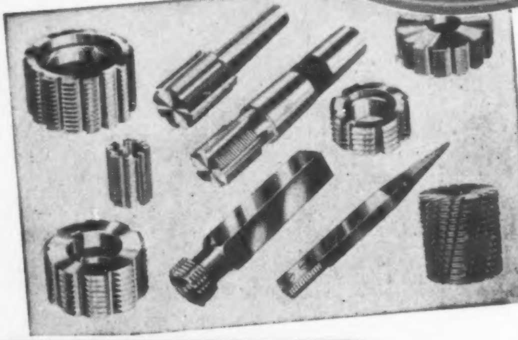

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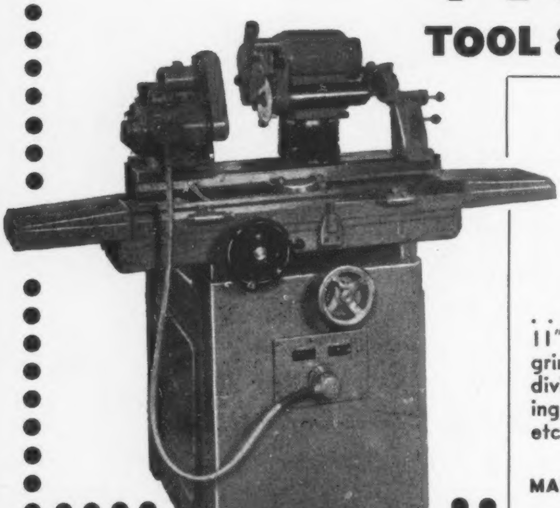

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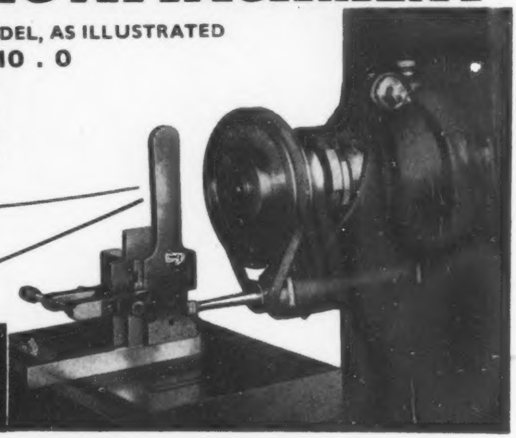

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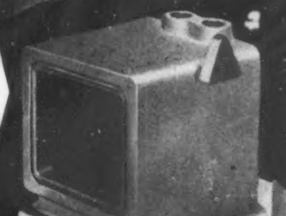

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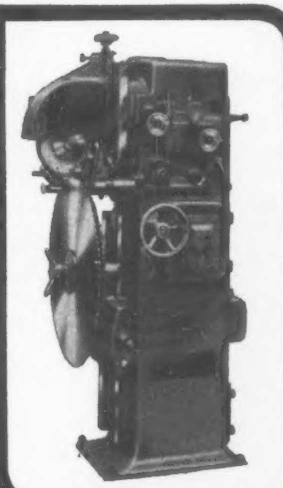

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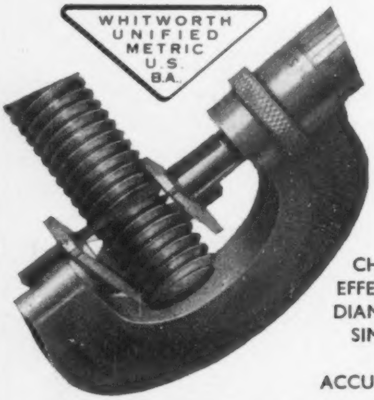

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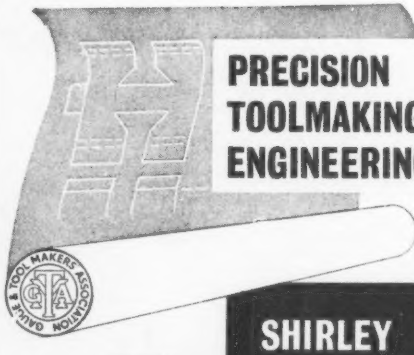

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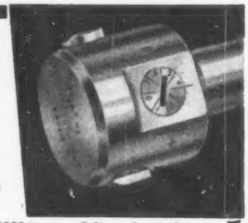

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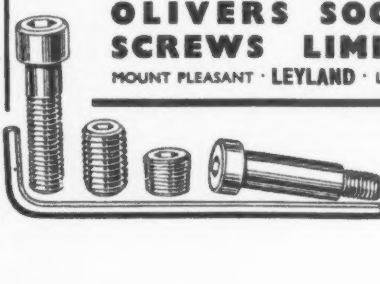

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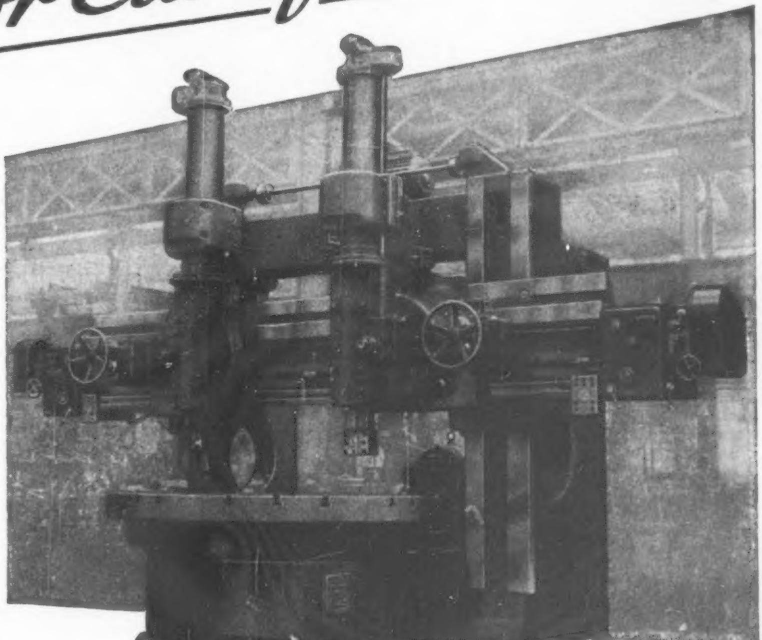

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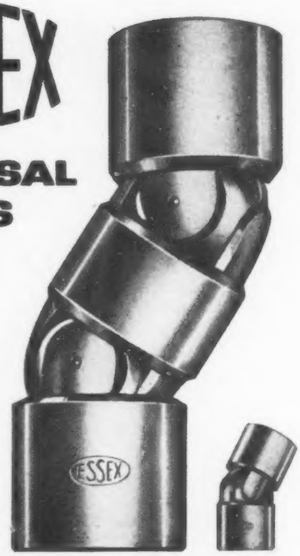

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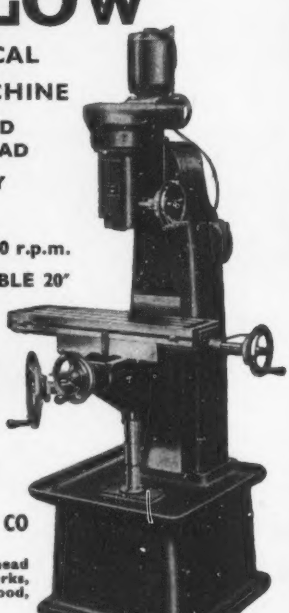

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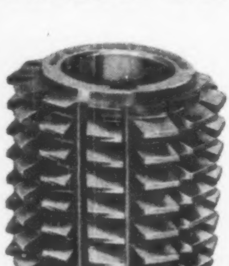

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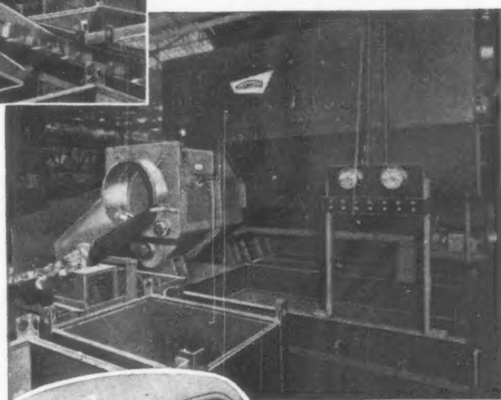

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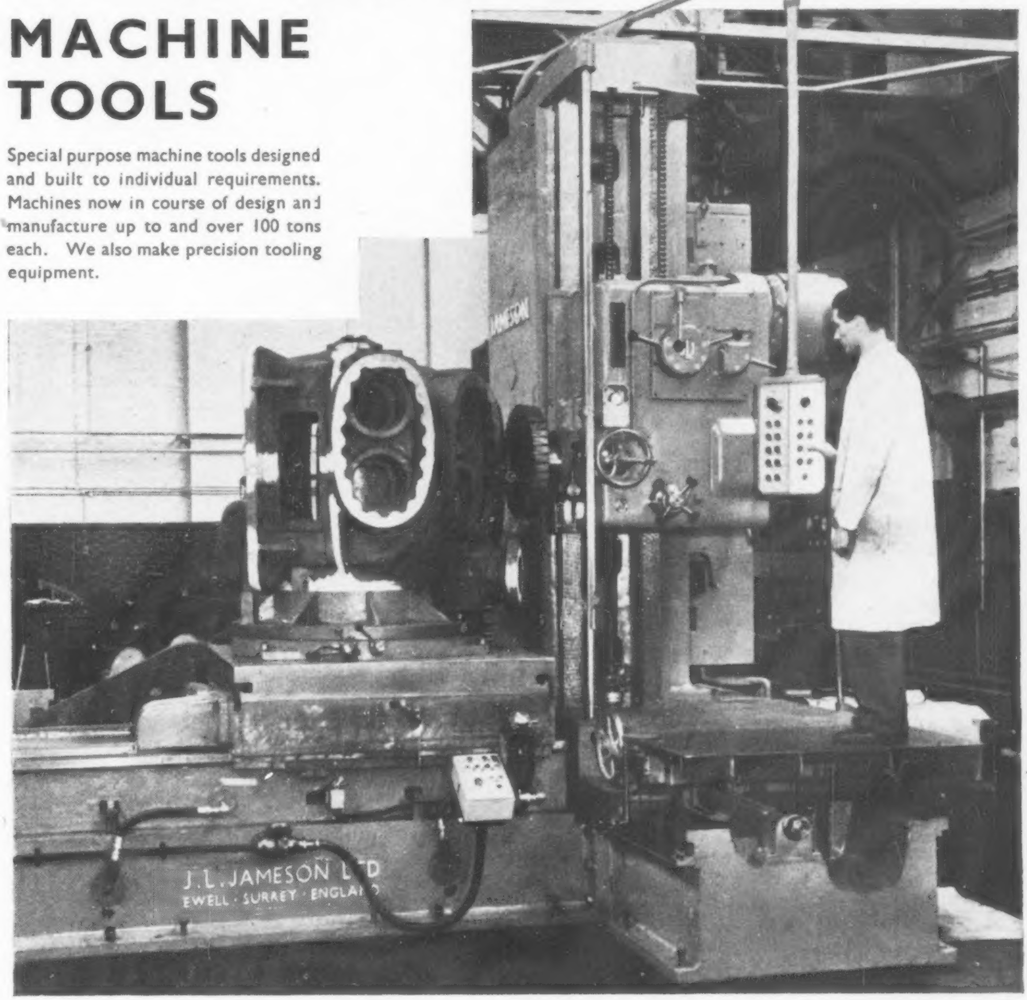

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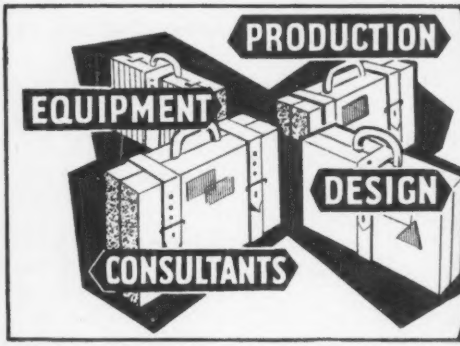

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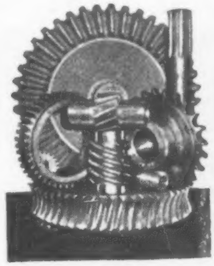

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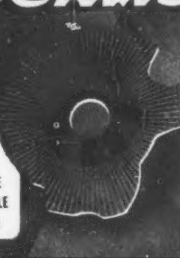

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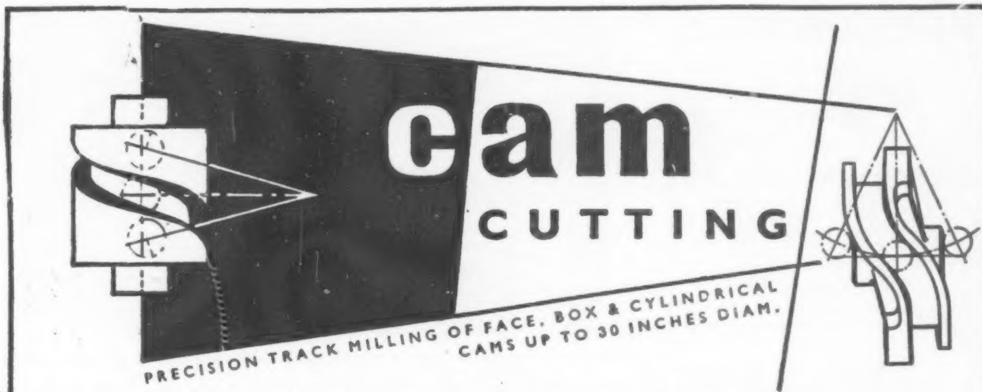

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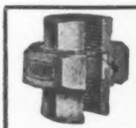

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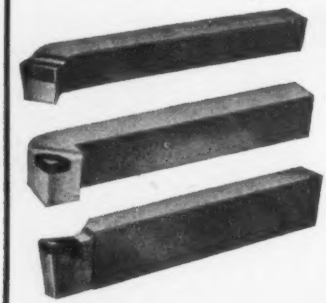

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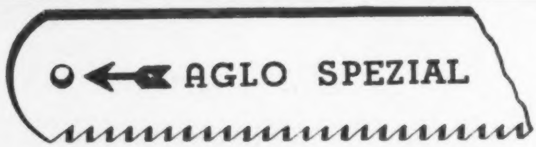

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Richards 45in. Swing Vertical Boring Mill, two tool heads. M.D 400/3/50.—W. BARNETT (MACHINERY), LTD., Yew Street, Wolverhampton. Telephone 21412.

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LANG 8½in. S.S. & S.C. Lathe to admit 4ft. 0in. between centres.
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New **MITCHELL OF KEIGHLEY** 12½in. S.S. & S.C. Lathe, to admit 8ft. 9in. between centres.
VOLMAN 8in. S.S. & S.C. Gap Bed Lathe, to admit 4ft. 6in. between centres.
New **MITCHELL OF KEIGHLEY** 10½in. S.S. & S.C. Lathe, to admit 7ft. 5in. between centres.
F.L.C.B. 13in. S.S. & S.C. Heavy Duty Lathe, to admit 17ft. between centres, 2 saddles.

CAPSTAN LATHES

WARD 3A Capstan Lathe, with collet chuck and bar feed, 1½in. capacity.
WARD No. 7 Capstan Lathe, with covered bed, arranged for chuck work, 2½in. hollow spindle.
WARD 2A Capstan Lathe, with collet chuck and bar feed, 1½in. capacity.

BORING MACHINE

TULLIS Horizontal Boring Machine, Floor Type with 3½in. traversing spindle, 9ft. 0in. by 2ft. 6in. tee-slotted baseplate.

UNIVERSAL GRINDING MACHINE

LANDIS 16in. by 36in. Universal Grinding Machine, with hydraulic feed

DRILLING MACHINE

GIRARD 5ft. 0in. Radial Drilling Machine. Elevating Arm, with Loose Box Bed. Two-motor type.

PLAIN GRINDING MACHINE

CHURCHILL 10in. by 36in. Hydraulic Plain Cylindrical Grinding Machine.

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HERBERT 23V Vertical Milling Machine. 68in. by 17in. table.
CINCINNATI No. 3 Dial Type Vertical Milling Machine, 62½in. by 15in. table, motorised.
ARCHDALE 18in. Vertical Milling Machine, 38in. by 10in. table.
CRAVEN "Rigidmill" Production Milling Machines, working surface of table 39in. by 13in., spindle speeds 25-400 r.p.m Two machines available.
EDGWICK 18in. Production Milling Machine, working surface of table 26in. by 12in.
New **VICTORIA** U1, U2 and U3 Universal Milling Machines.
ARCHDALE 20in. Horizontal Plain Milling Machine, 40in. by 10in. table.
CUTTAT HYPERMIL Production Milling Machine, 43in. by 10in. working surface of table, with 4 automatic cycles to table.

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NOBLE & LUND 11/16in. Cold Circular Sawing Machine.

SHEARING MACHINE

RUSHWORTH 10ft. 0in. by ¼in. Overcrank Guillotine Shearing Machine.

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EXCEL No. 3A Hydraulic Horizontal Spindle Surface Grinder, 24in. by 8in. capacity.
LUMSDEN 92LE Vertical Spindle Rotary Table Surface Grinder, 48in. diameter table.

All the above machines are motorised 400-440/3/50 cycles.

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LATHES

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New **MITCHELL** 12in. Centre Gap Bed Lathe, admit 8ft. 9in. between centres, motorised 400/3/50 cycles.
HOLBROOK Model B Type No. 17 S.S. & S.C. Lathe, swing over bed 18½in. dia., admit 42in. between centres, range of spindle speeds 10-525 r.p.m., motorised 400/3/50 cycles.
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WARD No. 2A Capstan Lathe, power feed to saddle and turret, ball chuck and bar feed, motorised 400/3/50 cycles.
WARD No. 3A Capstan Lathe, arranged for chuck work, six spindle speeds 84-1,050 r.p.m. motorised 400/3/50 cycles supply.

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WALDRICH Single Column Type Vertical Turret Lathe, fitted pentagon turret on cross rail, side head, maximum swing 70in. dia., motorised 400/3/50 cycles.

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REINECKER 21in. by 66in. Hydraulic Plain Grinder, motorised 400/3/50 cycles.
ORCUTT 20in. Hydraulic Spline Shaft Grinder, motorised 400/3/50 cycles.

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Hydraulic Press, 12 Tons capacity. Drummond Electraulic Model ABN12.—BOX Z285, MACHINERY, Clifton House, Euston Road, N.W.1.

Several OG Brown & Sharpe Automatics, capacity ⅝in., 8,400 series. Some with third slides and slotting attachments. —BOX Z291, MACHINERY, Clifton House, Euston Road, N.W.1.

Archdale 20in. Plain Horizontal Milling Machine. Table size 40in. by 10in. M/D 400/3/50. With vertical head.—ALBERT EDWARDS (MACHINERY), LTD., 79/89, Pentonville Road, London, N.1 'Phone: Terminus 0167/8/9.

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KINGSLAND HIGH STREET,
DALSTON JUNCTION,
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PRATT & WHITNEY 8in. S.S.S.C. Centre Lathe, 60in. B.C., 1⅜in. H.M., 8½in. 3-Jaw and 12in. 4-Jaw Chucks, 16in. Faceplate, Quick Change Gear Box, 3-Point Steady, Electrics 400/3/50. £175
REED PRENTICE 8½in. S.S.S.C. Centre Lathe, 1⅜in. H.M., Quick Change Gear Box, 12in. 3-Jaw and 4-Jaw Chucks, 14in. Faceplate, 30in. B.C., Electrics 400/3/50. £250.
BROWN & SHARPE No. 2 Surface Grinder, 400/3/50 (As New). £295.
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WE HOLD BIG STOCKS OF LATHES, SHAPERS, MILLS, DRILLS AND PRESSES.

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Classified Advertisements (*PLANT FOR SALE, contd.*)

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NEW BROADBENT 5ft. Vertical Boring and Turning Mill, swing 70in. dia. Ex stock.

PENSOTTI KTV1050 3ft. 6in. Swing Single Column Turret Type Vertical Boring and Turning Mill, with sidehead.

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ARCHDALE 28in. Heavy Duty Pillar Drilling Machine, No. 5 Morse Taper Spindle.

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NORTON 24in. by 10in. Hydraulic Horizontal Spindle Surface Grinding Machine.

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CHURCHILL-REDMAN 9in. Centres All-geared Gap Bed S.S. & S.C. Lathe, admit 54in. between centres.

ALFRED HERBERT No. 7 Junior Combination Turret Lathe, Flamard Bed.

WARD No. 3A Bar Feed Capstan Lathe, high speed range auto feed, cross slide.

CHURCHILL-REDMAN 24ND Turret Type Boring and Surfacing Lathe, 24in. swing.

CINCINNATI "Hydromatic" 34-48 Hydraulic Horizontal Production Milling Machine, table 67in. by 18in.

MILWAUKEE 2H Plain Horizontal Milling Machine, table 50in. by 10in. Rebuilt.

VAN NORMAN 22L Horizontal and Vertical Milling Machine, table 45in. by 10in., dividing heads, slotting attachment, etc.

BROWN & SHARPE No. 3 Standard Vertical Milling Machine, table 64in. by 17in.

CINCINNATI No. 3 Dial Type Vertical Milling Machine, table 62½in. by 15½in.

ARCHDALE 18in. High Speed Vertical Milling Machine, table 40in. by 10in. Unused.

KLING Double Ended Punching, Shearing and Cropping Machine, shear ½in. plate, 7in. by 1in. bars, crop 6in. by 6in. angles, 2½in. bars, punch 1$\frac{1}{16}$in. dia. through 1in. plate.

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SELLERS "Powerflow" 14ft. by 5ft. by 5ft. Heavy Duty Spiral Drive Planing Machine, 50 h.p. motor.

GOULD & EBERHARDT 14in. Stroke Toolroom Precision Shaping Machine, compound Swivel table

PRATT & WHITNEY Model B 6in. Stroke Tilting Head High Precision Toolroom Slotting Machine, auto rotating table, 19½in.

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& SONS LTD.
CANAL STREET, NOTTINGHAM
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TWO **B.S.A.** 9in. Single Spindle Chucking Automatics. 400-440/3/50. Good equipment including Air Chucks, Toolholders, pick-off gears, etc.
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TWO **WARD** No. 7 Combination Turret Lathes, single pulley drive. One fitted with automatic ball chuck.
WARD No. 8 Combination Turret Lathe, 415/3/50, 4½in. H.S. Taper turning attachment.
BULLARD Vertical Boring and Turning Mill. 38in. swing. Twin columns, pentagon turret and one plain swivel toolpost. S.P. drive.
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URQUHART LINDSAY & ROBERTSON ORCHAR Centre Lathe, 16in. by 30ft. 6in. between centres.
LIBBY Model 2H-8 Combination Turret Lathe, 8½in. hollow spindle.
NILES Centre Lathes, 15in. centre height by 28ft. between centres. (Two available.)

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BULLARD 11in. eight-spindle Vertical Chucking Automatic.

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Similar 250 amp. units—**£71.**
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Classified Advertisements (*PLANT FOR SALE, contd.*)

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CRAIG & DONALD Model 400/10. All Steel Motorised Double Geared Press Brake, of steel plate construction. Arranged motor drive for 440/3/50. Pressure exerted 400 tons. Former capacity 10ft. by ⅞in. Depth of gap 12in.

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Woodhouse & Mitchell No. 4 A.G.H Capstan Lathe. Hollow spindle 2½in. dia., 8 spindle speeds 30-750 r.p.m. Screw-cutting. M/D 400/3/50. Ball chuck, bar feed and collets.—ALBERT EDWARDS (MACHINERY), LTD., 79/89, Pentonville Road, London, N.1. 'Phone: Terminus 0167/8/9.

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GRANOR OF HALIFAX 11in. Gap Bed Lathe by 8ft. 0in. b.c. Hole in spindle 3⅛in. dia. 400-440/3/50.

MITCHELL OF KEIGHLEY 10½in. Gap Bed Lathe by 5ft. 5in. b.c. 400-440/3/50.

MITCHELL OF KEIGHLEY 12½in. Gap Bed Lathe by 6ft. 9in. b.c. 400-440/3/50

EXCEL No. 3/12 Hydraulic Horizontal Spindle Surface Grinding Machine. Capacity 24in. by 8in. Coolant equipment. Motorised 400-440/3/50.

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NEWALL Type L 10in. by 24in. Plain Grinding Machine. 400-440/3/50.

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POLLARD 21A Single Spindle Vertical Production Drilling Machine.

WICKSTEED Hydraulic 28in. Cold Sawing Machine. 400-440/3/50.

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Classified Advertisements (*PLANT FOR SALE, contd.*)

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MITCHELL 16½in. Lathe, 17ft. 9in. between centres.
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KRETA 8in. Gap Bed Lathe, admit 40in. between centres. (Infinitely variable speed.)
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VICTORIA V2 Vertical Miller, 45in. by 11in.
VICTORIA V3 Vertical Miller, 60in. by 12½in.
SEGIC Vertical Miller, 22in. by 9½in.
TAYLOR Vertical Miller, 17½in. by 5½in.
MARLOW Vertical Miller, 22in. by 6in.
VICTORIA U0 Universal Miller, 36in. by 9in.
VICTORIA Universal Millers from 36in. by 9in. to 72in. by 15in. tables.
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DENBIGH C2 Plain Miller, 54in. by 10in.
DENBIGH C4 Plain Miller, 46in. by 10in.
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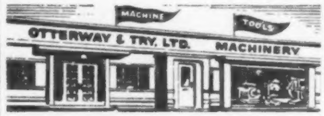

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Trade Enquiries Welcomed.

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Several Plain Cylindrical Grinders for sale from 6in. by 18in. to 14in. by 18in. Churchill, Landis and Precimax. Write stating size of interest to BOX Z325, MACHINERY, Clifton House, Euston Road, N.W.1.

Fork Lift Truck, Conveyancer Mark IV. Capacity 28 cwt. Fitted with new reconditioned petrol engine. All in excellent order.—BOX Z330, MACHINERY, Clifton House, Euston Road, N.W.1.

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BERRY A.G.H., 6½in. centre by 32in., in gap 26in. motorised.
MITCHELL 7½in. by 42in. by 25in. gap, A.G.H., motorised.
CHURCHILL CUB Lathe, 6in. by 24in., A.G.H., mot. 415/3/50.

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WARD No. 7 A.G.H. Bar feed, ball chuck, etc., motorised.
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OLIVETTI FP2 Manufacturing Miller. Table 52⅜in. by 14¼in. Longitudinal traverse 39⅜in.
RICHMOND VHM Vertical Mill.
New VICTORIA V2 Vertical.
HOLROYD T117 Thread Miller.
HELLER Automatic Thread Millers (4).

MISCELLANEOUS.

JONES & SHIPMAN 2-spindle Pillar Drill, with No. 3 M.T. spindle, power feed.
New ESSEX 18 Bandsaw.
New RICHMOND SR2 3ft. Radial Drill.

All Machines motorised 400/3/50 unless otherwise stated.

MACHINERY'S

SMALL ADVERTISEMENTS

BRING RESULTS

Use form on Page 160

Qualters & Smith (New) 6in. and 8in. Hacksawing Machines. Motorised 400/3/50.—SOUTHERN ENGINEERING & MACHINERY CO., Connaught Buildings, Tanners Brook, Millbrook, Southampton. Tel.: Southampton 73101.

Heald 81 Gagematic Internal Grinder, with automatic diamond dressing and hydraulic feeds.—BOX Z408, MACHINERY, Clifton House, Euston Road, N.W.1.

Acme Gridley 1⅝in. Bar Capacity 4-spindle Automatic Lathe. Excellent condition.—BOX Z414, MACHINERY, Clifton House, Euston Road, N.W.1.

SITUATIONS VACANT

If you do not wish your reply to any Box No. advertisement in this section to be forwarded to certain firms, please advise us. Your reply will then be destroyed, but you will not be notified as this would disclose the identity of the advertiser.

Planning and Estimating Engineer required by progressive precision engineering Company in Sussex manufacturing own specialised products.—Write giving full details of experience, age and present salary to BOX Z243, MACHINERY, Clifton House, Euston Road, N.W.1.

Highly Paid Secure and Interesting posts are always available for technically trained men. Find out how you can put some letters after your name by preparing at home in "No Pass—No Fee" terms for A.M.I.Mech.E., A.M.I.Prod.E., A.M.S.E., City and Guilds, etc., etc. Full details of exams. and hundreds of courses in all branches of Engineering, Draughtsmanship and Management, the benefits of our Employment Dept., and unique record of 95 per cent. successes, are given in "Engineering Opportunities"—valuable 144-page Guide which will reveal many chances you are now missing. Write for your copy today (stating subject of interest) —FREE and without obligation.—B.I.E.T., Dept. 34a, Wright's Lane, London, W.8.

LONDON COUNTY COUNCIL.

Paddington Technical College, September, 1958.

Assistant Grade A to teach Engineering Workshop Practice and Technology to Inter C. and G. level to machine shop trade apprentices and Engineering Craft Practice and Theory to Final C. and G. level to engineering trade apprentices.

Full Technological Certificate or equivalent required with good industrial experience in mechanical engineering.

Burnham F.E. salary scale £475 by £25 to £900 plus London allowance, additions for training and qualifications; increments within scale for experience.

Application forms from SECRETARY AT COLLEGE, Saltram Crescent, W.9, to be returned by 13th September, 1958. (1557)

Inventive Practical Mechanical Engineer required by small, but well-established Firm for Development Department, engaged on precision garage equipment. Good conditions and permanent position.—Please send in confidence full particulars of past experience, salary required, etc., to BOX Z263, MACHINERY, Clifton House, Euston Road, N.W.1.

Pipe Bending Machines. B. O. MORRIS, Coventry, are going into production of American Wallace pipe bending machines up to 18in. capacity. They seek an engineer to handle technical enquiries with the customer, the design office, the works and the Americans. The responsibilities of this position will be dependent upon the calibre of the man appointed.—Apply giving full details to the General Manager.

Applications Invited From engineers with high class press tool experience in light gauge material. Successful Applicant will be required to establish new toolings on automatic presses of various types, e.g., C.V.A. slide feed, 4 slide, Waterbury and other special-purpose machines, acting in liaison with design and production departments. An excellent opportunity for ex-apprentice engineers with H.N.C. or similar standard. Five-day week, pension scheme and modern welfare arrangements. Housing available if required.—Reply SUPERINTENDENT, SIEMENS EDISON SWAN LTD., Cosmos Works, Harlow, Essex. Interview by appointment.

First Class Tool Maker and Multi-spindle Auto Setter required. Top rates and housing offered to experienced men. Surrey-Hants border.—BOX Z283, MACHINERY, Clifton House, Euston Road, N.W.1.

Production Engineer Required to take complete charge of medium-sized engineering works. S.E. area. Manufacturing aircraft equipment. Experienced planning and time fixing essential. Position offers scope to right man.—'Phone or write full brief details to SECRETARY, O.E. CO., LTD., Dugdale Street, S.E.5. RELiance 5094.

Chief Inspector Required for A.I.D. and A.R.B., able to take complete charge and full responsibility small Inspection Department. Permanent position for suitable applicant. Littlehampton area.—Apply BOX Z292, MACHINERY, Clifton House, Euston Road, N.W.1.

Sales Manager Required for well-known Company in the Midlands manufacturing Pressure Die Castings in aluminium and zinc alloys. It is desirable for candidates to possess technical knowledge and to have existing contacts with major consumers of the products. Enthusiasm is essential. Replies will be treated in strict confidence and must state age, experience and salary required.—BOX Z252, MACHINERY, Clifton House, Euston Road, N.W.1.

Cold Heading Setter Operator wanted for small Greenbat Bolt Plant. Versatile man with trimming and threading experience preferred. Good salary plus overtime rate.—FRAZER, 70, St. Albans Road, Cheam, Surrey. Fairland 7880.

W. H. ALLEN SONS & COMPANY LTD.,
BEDFORD.

require for their Production Engineering Department

WORK STUDY ENGINEERS

Experienced in the application of Work Study to machine or assembly shops.

DEVELOPMENT ENGINEERS

To investigate and improve manufacturing techniques.

DRAUGHTSMEN

For the design of Jigs, Tools, Fixtures and Tool Layouts.

These positions will interest men of sound education and practical experience, who can carry out on their own initiative, studies and investigations into problems affecting the small-batch production of Steam and Gas Turbines, Diesel Engines, Centrifugal Pumps and Electrical Machinery.

Please apply in writing, stating age, present salary and full details of education, training and experience, to—

THE PERSONNEL MANAGER

REPRESENTATIVES

Well Established Medium-sized firm of Experimental Engineers wishes to contact freelance agents able to introduce high class work on commission basis, wide facilities available.—Write in confidence to BOX Z298, MACHINERY, Clifton House, Euston Road, N.W.1.

Old Established Reputable Midland Manufacturers of repetition turned parts would like to contact energetic agent in touch with users in London and Southern Counties. Expanding Automatic Shop offers opportunity of good commission earnings.—BOX Z284, MACHINERY, Clifton House, Euston Road, N.W.1.

LEADING COMPANY OF

MACHINE TOOL IMPORTERS

AND

MANUFACTURERS

wish to Appoint a Senior Technical Sales Representative in Scotland. The position calls for a fully trained man between 30 and 40 who will be required to develop the Company's imports and products throughout the industry in Scotland. Applicants should preferably reside in the Glasgow area and should have had considerable experience in both the application and sale of high class machine tools.

The appointment holds out excellent prospects for a man of integrity and drive who possesses the technical qualifications necessary for successful sale of our equipment. A car will be provided.

Write in confidence to BOX Z260, MACHINERY, Clifton House, Euston Road, N.W.1.

REPRESENTATIVES—*continued*

THE ROCKWELL MACHINE TOOL COMPANY LIMITED

require several

SALES ENGINEERS

owing to the expansion taking place resulting from the merger with the Coventry Gauge & Tool Company Limited, for the following Districts:—

LONDON · MIDLANDS · WEST OF ENGLAND · YORKSHIRE · NORTH-EAST COAST · EAST AND WEST SCOTLAND

Applicants must have a sound engineering background, Machine Tool sales experience and be well-connected in the area concerned. Successful applicants will receive salary, commission and car.

Please apply by letter to:

WELSH HARP, EDGWARE ROAD, LONDON, N.W.2

SALES MANAGER

A first class Sales Manager required to take complete control of Sales Organisation in a modern progressive Company in the Toolmaking and Engineering Industry, Birmingham Area.

Applicant should not be more than 45 years of age, an experienced sales administrator, should have a good education and personality with initiative and drive. Excellent opportunity with prospects offered to applicant who desires to settle down with expanding Company. Substantial salary and commission. Car is provided.

Please submit full details in confidence— BOX Z287, MACHINERY, Clifton House, Euston Road, N.W.1.

SITUATIONS WANTED

Engineer, Production, A.M.I.P.E. Age 45. Practical approach with substantial experience production engineering and control all functions. Organisation and cost conscious. Seeks responsible interesting and active post. BOX Z202, MACHINERY, Clifton House, Euston Road, N.W.1.

Senior Mechanical Designer. Former Chief Draughtsman. Seeks progressive situation. Experienced in great variety of Machinery, Special Purpose Machines, General Tooling, Machine Tools, Industrial Turbines, Aero-Engines, Heavy Engineering, etc.—BOX Z119, MACHINERY, Clifton House, Euston Road, N.W.1.

Engineer, Toolmaking and General Engineering, 8 years works and production manager. Experienced planning, estimating and shop floor control. Age 37. Seeks responsible position.—BOX Z248, MACHINERY, Clifton House, Euston Road, N.W.1.

Engineer, 43, Ex Tool Room and jig and tool D.O. Past 9 years sales, inside and outside. Good knowledge sheet metal working machines. Resides Essex. Seeks permanent post either inside or outside.—BOX Z249, MACHINERY, Clifton House, Euston Road, N.W.1.

Chief Inspector, A.I.D., A.R.B., desires change. Fully conversant with up-to-date methods of inspection both on tools and production components, backed by comprehensive training in toolroom and workshop. Salary £1,000 per annum. Age 38 years.—BOX Z281, MACHINERY, Clifton House, Euston Road, N.W.1.

Practical Engineer, 42, with extensive toolroom, machine shop, drawing office and production engineering experience. Thorough knowledge of inspection including standards and measurements. Knowledge of special-purpose machines and fine precision gear production. Seeks position of trust and responsibility.—BOX Z282, MACHINERY, Clifton House, Euston Road, N.W.1.

Senior Sales Engineer, Many years experience English and foreign machine tools seeks position of responsibility. Expert knowledge Import Licensing, Sales Promotion, etc.—BOX Z293, MACHINERY, Clifton House Euston Road, N.W.1.

Team of Three Project Pro-duction engineers require positions in progressive Company. Average age 32 years. Total of 50 years experience in the field of engineering, i.e., Tool and Instrument Making, Time and Motion Study, Estimating, Rate-fixing, Tool Design, Development, Inspection, Electronics Servo Mechanisms, Batch and Production Manufacture. At present residing in N.W. Middlesex.—BOX Z300, MACHINERY, Clifton House, Euston Road, N.W.1.

A.M.I.P.E. Engineer, Experien-ced in machine design, mechanical handling, plant layout, automation, lubrication, technical sales, buying, advertising, seeks management appointment. Middlesex or London.—BOX Z299, MACHINERY, Clifton House, Euston Road, N.W.1.

Engineer, H.N.C., 34, Apprentice trained. Wide experience planning, estimating and sales seeks post with housing facilities. Minimum salary £900 p.a.—BOX Z250, MACHINERY, Clifton House, Euston Road, N.W.1.

REPRESENTATIVES

Representation, London and Home Counties. CAPTAIN A. J. DRONSFIELD—who formed and organised the Engineer Buyers and Representatives Association and for last ten years acted as its General Secretary—has terminated his agreement and will be free August, 1958, to consider propositions for representation in above area on agency or other basis. Qualified Production Engineer, ex A.M.I.Mech.E. Exceptional sales record Negotiations any level.—"Birchwood," Effingham Road, Copthorne, Sussex. 'Phone: Copthorne 0133.

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PLANT WANTED

WANTED FOR SCRAP YARD

LARGE SET CROCODILE SHEARS

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Box Z 288, MACHINERY Clifton House, Euston Road, N.W.1

Wanted, Hydraulic Pump, 3 or 4 throw, motorised, having minimum capacity of 420 gallons per hour at 1 ton per sq. in.—BOX Z290, MACHINERY, Clifton House, Euston Road, N.W.1.

Wanted, Matterson 6in. Bevel Gear Generating attachment for Shaper.—PIDGEN BROS., LTD., Helmet Row, Old Street, E.C.1.

Wanted Urgently Taylor & Challen No. 9 Double Action Deep Drawing Press. Please state age, price and fullest particulars.—BOX Z295, MACHINERY, Clifton House, Euston Road, N.W.1.

Wanted Good Secondhand 8ft. to 9ft. table Vertical Boring and Turning Mill. Double ram type.—Full details and price to DARFIELD ENGINEERING CO., LTD., Eastbrook Mills, Filey Street, Bradford 1, Yorks.

CONTRACT WORK

Design Capacity Available, Mechanical, Electrical and Chemical, Jigs, Tools, Special Machines, Tracing, etc. CHESTER INDUSTRIAL CONSULTANTS, 1116, Warwick Road, Acocks Green, Birmingham. 'Phone: Acocks Green 2630.

INDEX TO ADVERTISERS

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INDEX TO ADVERTISERS—*(continued from page 163)*

Cogent

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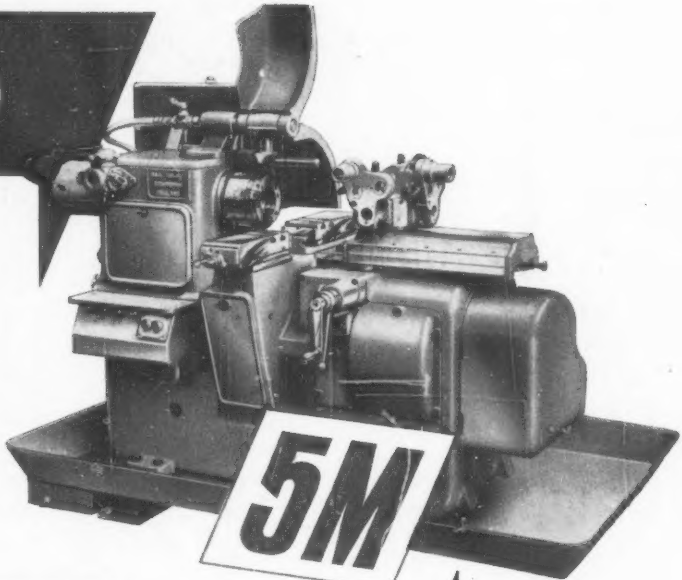
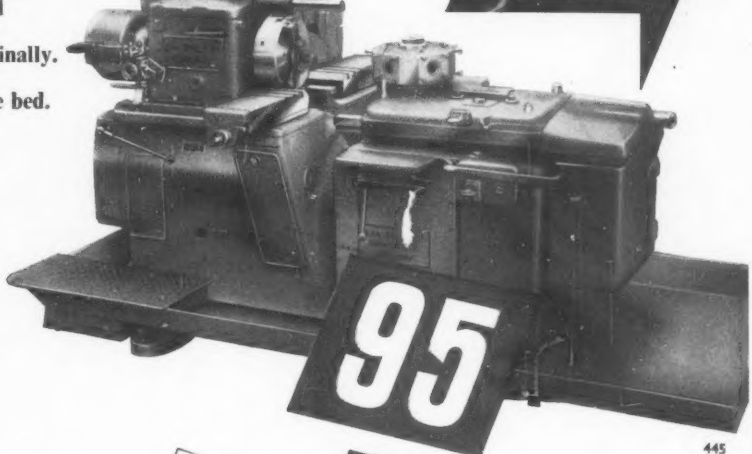


5M **Maximum swing $7\frac{3}{4}''$. Swing over cross slides $6\frac{5}{8}''$. Independent motors for spindle drive and rapid motion to turret and cross slides. Wide range of speeds with three automatic changes. Suitable for small batch work.**

95 **Maximum swing $12\frac{1}{2}''$. Swing over cross slides $10\frac{3}{4}''$. Wide range of speeds and feeds. Three automatic speed changes. Headstock adjustable $4\frac{3}{4}''$ longitudinally. *FIVE* face turret; adjustable 2″ along the bed.**

FULLY AUTOMATIC apart from chucking. Air chucking is available in the range of additional equipment



445

	5M ins	5M mm	95 ins	95 mm
Maximum swing	$7\frac{3}{4}$	197	$12\frac{1}{2}$	317.5
Maximum swing over cross slides	$6\frac{5}{8}$	168	$10\frac{3}{4}$	273
Cross slides stroke	$2\frac{3}{4}$	70	4	101.6
Cutting travel of turret	$4\frac{3}{8}$	111	$5\frac{3}{4}$	146
Number and range of spindle speeds	21 FORWARD 14 REVERSE 58 to 1458 r.p.m.		30 40 to 834 r.p.m. or 60 to 1220 r.p.m.	
Horse power of main motor	$4\frac{1}{2}$		10	

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